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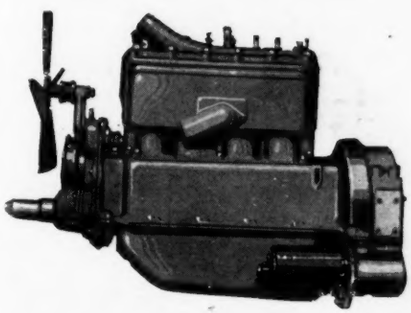

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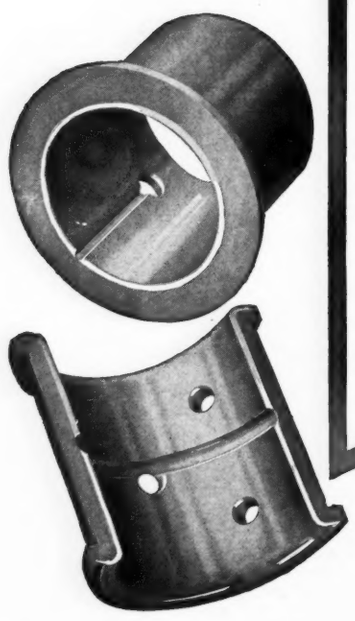

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLIV. NEW YORK—THURSDAY, JUNE 9, 1921 No. 23

The Stage Is Set—Now for a Selling Campaign

With practically all prices adjusted to the sentiment of the times and the cost of manufacture, the job remains to sell the public and get the business. Secretary Hoover getting ready to help. Points out importance of automotive facts to other industries.

By Clyde Jennings

TWO major events of last week indicate rather definitely the task immediately ahead of the automotive industry. The first was the unofficial expression of opinion gathered during the N. A. C. C. meeting, which was of much more importance than the meeting itself; the second was the meeting of representatives of the industry with the Secretary of Commerce. Both indicate that, now that the stage is set, it is time to quit talking troubles and to sell automobiles.

The BIG IDEA has finally got across to the automotive industry. Here, there and everywhere prices are being adjusted. There was not a man at the National Automobile Chamber of Commerce annual meeting last week who was not outspoken in the sentiment:

> **"It is up to the industry to settle the price question right now and end the feeling of uncertainty that exists in the public mind. People do not buy on a falling market and we must stabilize values immediately."**

The N. A. C. C., of course, did not discuss prices, nor did the members attempt to indicate to each other what should be done. But all of the king's horses and all of the king's men could not have stopped the conversations between the men present when they were not in meeting.

Sales (and, of course, prices) were uppermost in their minds. As far as public expression goes they were all of a mind. Some laughed at the idea that an expression from the N. A. C. C. would help the situation. Instead of favoring such action, the sentiment was about like this:

> **"The manufacturer who is not sold on the necessity of clearing the atmosphere on price questions need only consult his own sales department and get an expression from his dealers. Perhaps his competitor announces a price cut. The next morning he gets a bunch of telegrams cancelling shipping orders for his cars. The dealer knows what prospective sales are competitive and he knows which he has lost, or will be delayed. So he stops deliveries for these cars.**
>
> **"Or, if he cuts the price of his own cars, he gets telegrams asking for shipments, because the dealer knows what prospects are holding back merely because of price.**

"No matter whether the manufacturer has cut or not, he can easily get the importance of price to present day sales."

That is about the way the industry stands at present. "Cut and cut now" was the unofficial and unanimous sentiment when the leaders were together.

And the flock of price announcements that came in left no doubt but that they were acting on their best judgment.

There is, however, a second chapter to this movement that is quite as important as the price cutting.

This is to justify the present price. How many times have you read advertisements during the last few months that announced "the last, final reductions" on clothing or other commodity. It is possible that the public will still be suspicious after reading the new prices. You can't blame the public if it is. For months and months the public has been fed on information as to war profiteers, speculations that were boosting prices, news of industrial and labor organizations that were upholding purely fictitious prices, the greed of landlords and many other things. There must be some sane, honest statements to counteract the opinions left by this long siege.

These sane, honest statements can be applied to automotive vehicles. We believe that this industry is honest and that it is merchandising its products honestly. It is giving honest value and it has, in the main, written off its share of the losses.

Then why not convince the public of this?

Why not let every automotive advertisement come out strong with honest value statements?

Why be afraid to discuss the real value of the car or the truck?

All hands will have to admit now that the effort to do business on the 1920 plan failed because the attitude of the public had changed. The seller must meet the attitude of the buyer. He must convince the buyer. Foolish publicity, such as serves when the buyer meets the attitude of the seller, will not serve the purpose for this.

The entire industry needs honest, substantial publicity. Despite all that has been said and done in the last five years, there are many who dare to doubt the utility of the industry. These folk must be convinced. The individual who buys a vehicle must be convinced that he has made a good buy.

There were other happenings of the week that worked to the same conclusion that the industry has reached in the slow course of reasoning that has governed it since "FORD DID IT" last fall. The entire course of development was plain to all who wanted to study the future then. Some were reactionary; some did hasty things; now all realize that the best thing to have done then was to write off the loss.

A lot of manufacturers who wanted the public to share in the losses have found that the public was of a different mind. The public became discriminating and bought of those who made the best practical showing—and you cannot convince any man to-day that price is not a practical argument.

There is one consolation to be gained—and that is that the public apparently is sold on the honesty of manufacture of the entire industry. This is shown in the inclination of the public to follow the price, regardless of previous choice of car. If the car they wanted did not cut, then they bought the one that did.

But to get back to the other happenings.

Credit Now Ample

W. P. G. Harding, governor of the Federal Reserve Bank, spoke to the N. A. C. C. He did not say anything about the prices of automobiles in so many words, but he did say much about price trends. Also he vouched for the statement that the public held a tremendous buying power to-day. He said that the changed conditions had brought about a buyers' market in all lines, and he thought that this was a beneficial state of affairs. He frankly favored a buyers' market because it brought out the best that was in the seller, both as to methods of manufacturing and marketing. The governor reviewed the history of finance, from the banking standpoint, since the beginning of the war, and dwelt especially on the period following the war. This review is more or less familiar, but his conclusion was new. It was, in effect, as follows:

AFTER setting forth that the credit foundation had now been laid for new activities, Governor Harding in his address to N. A. C. C. members suggested the revival of the slogan: Business as usual.

He said this slogan was tried during the first days of the war, but was dropped when it was found to be impractical. Now, he suggested, was a very fine time to revive it and to let the optimists do the talking. In this connection he said:

"Just at present the pessimist is entirely too prominent. The pessimist is a very useful person. He keeps us from running away with ourselves. He should have been listened to a year or more ago. Just now he should be silenced.

"My personal objection to a pessimist is that he operates best at the wrong time."

The banks are now in excellent position to help any helpful business. They have the proper basis for extending credit and there is no reason for any discrimination between helpful industries. In some quarters business is dragging, and you automotive manufacturers should strike out boldly to push business. Your business to-day is very large; it has many ramifications, and if you will do your best to help business you have a great power for good and it will not be long before all lines of business are responding.

Meet with Secretary Hoover

The next day came another move in the same direction. It took place in Washington, where a number of automotive manufacturers met with Secretary of Commerce Hoover at the latter's invitation. J. Walter Drake acted as spokesman for the manufacturers. At the opening of the meeting the manufacturers were just a bit doubtful as to what Secretary Hoover wanted with them and how he was going to get whatever it was that he wanted.

The Secretary quickly allayed any suspicion by stating his position quite clearly. He said at the outset that he wanted only the figures that would be helpful to business, but he told the automotive manufacturers that their industry had become of such importance in the business world that other industries were asking for their figures showing the status of the industry.

The accuracy and excellence of the present automotive industrial figures were conceded by the Secretary, but he said that to other industries they would be much more valuable if they were given by price classes. He also

made it clear that he was not interested in the figures of any one factory, but in figures that were representative of the industry. He did not even care how these figures were gathered, except that the data be accurate.

In explaining his dealings with the National Automobile Chamber of Commerce, Secretary Hoover stated that he was entering upon this alliance because it was his information that this was one of the really helpful industrial organizations and is, and has been, clear of doubtful business practices. He said that some trade organizations could not be considered in this relation because their activities were chiefly in restraint of trade, rather than a promotion. He expressed his pleasure in meeting an industrial committee that comprised association members as well as non-members. He said that he was quite willing that the N. A. C. C. should be the chief agent in gathering statistics, and that he wanted such statistics as the individual manufacturers could see the benefit of. He had no desire to force figures from an industry.

It was practically agreed that the monthly shipping figures comprised the data that other industries were chiefly interested in. Drake informed the Secretary that the practice of the industry was to regard future orders, or annual sales contracts merely as a means of allotment and not as "future orders." It was Drake's thought that the shipping figures were the only informative data, and that these could be separated into price classes, also the percentage of closed cars could be given by classes.

Drake presented to the Secretary the industry's request for information from other branches of trade. He said that additional steel figures were needed, also crop statistics, figures showing the status of the meat packing, textile and shoe industries and accurate and prompt reports of railroad passenger miles and railroad freight ton-miles. The Secretary said that he thought these figures would form a part of the complete picture of business that the Department contemplated publishing, once the facilities were equal to the task that the Department had undertaken.

While discussing this question the need of more detailed export and import figures was taken up. Drake said that the manufacturer wanted to know what kind of motor cars were going to a certain country. The Secretary said that this need had early impressed him, but that to get the port figures classified properly it was necessary that this service be transferred to the Department of Commerce. This work was now under the Treasury Department. He said that some time ago **he and Secretary Mellon thought they had adjusted this phase of the work, but that the comptroller had decided that, while they might shift the labor from one department to the other, they could not shift the appropriation.** Now it was necessary to await a new comptroller. The Secretary made no further comment on this, but after the meeting had adjourned the manufacturers who were present talked it over at length as an illustration of business methods of government.

The Secretary said that in time he hoped that export figures would be classified in a way to be most helpful. He told of speeding up the compilation and publication of foreign trade figures.

Another matter of considerable importance was the naming of two men to be placed in the Department of Commerce to represent the industry while the new plans for the promotion of domestic and foreign sales were being carried forward. First the Secretary wanted as a trade advisor in the Bureau of Foreign and Domestic Commerce a broad-gage salesman who could form the plans upon which statistics were to be gathered and used both at home and abroad. This man would also help to educate the traveling agents who will go to other countries to look into trade prospects. This man, said the Secretary, must be a man who, in private life, can earn several times what the Department can pay him. He must be a very self-sacrificing individual for a period of perhaps a year while the Department is being educated. This obligation was assumed by the representatives of the industry.

Another man is wanted for the Bureau of Standards. This man, the Secretary said, should be both an engineer and production man. The idea behind this appointment was to make the Bureau of the utmost practical value to the industry. The salary in this job will be utterly out of keeping with that which the man wanted would earn in industrial employment. The manufacturers promised to suggest such a man, but said they would probably consult the Society of Automotive Engineers on this, as they had regarded the Bureau of Standards as the engineering branch. Secretary Hoover said he was quite anxious to make this Bureau of practical manufacturing value to the industry.

NOT much has been said recently about the prices of trucks.. The faster moving passenger car is the center of attraction and is experiencing a revival of selling.

Here is a curious result. Early this week a truck man came to talk over the prospects and, after considerable discussion, he remarked:

"We are very much afraid someone will start a price cut on trucks."

Evidently the passenger car is faster than the trucks in other than road operating speeds.

An interesting point was raised when the Secretary asked if it was possible to report periodically on production as a percentage of capacity. The manufacturers said they were at a loss to measure capacity and did not feel that they could make an accurate report on this.

At the conclusion of the meeting Drake offered to submit to the Secretary at once a memorandum setting forth the extent to which the industry could co-operate in the effort to broaden and stabilize business generally and what the industry needed for the same purpose. He also said he would forward suggestions for appointment to the two positions at the same time. The Secretary said that this course was satisfactory to him.

Those present were: J. Walter Drake (Hupp), Alfred H. Swayne (G. M. C.), A. T. Waterfall (Dodge), E. A. Williams, Jr. (Garford), Gaston Plaintiff (Ford), J E. Kepperley (Overland), H. S. Vance (Studebaker), R. A. Hauer (International), M. L. Hemmingway (M. A. M. A.), Pyke Johnson and John C. Long (N. A. C. C.), T. F. Cullen (Chilton Pub. Co.), Clyde Jennings (Automotive Industries).

THERE are 107 agencies for foreign cars in Holland. American manufacturers have the largest representation with 37. It is estimated that there are now about 10,000 passenger cars in use throughout Holland; 3000 American cars went into that country during 1920 alone.

New Federal Is Heavier and More Powerful Than Earlier Models

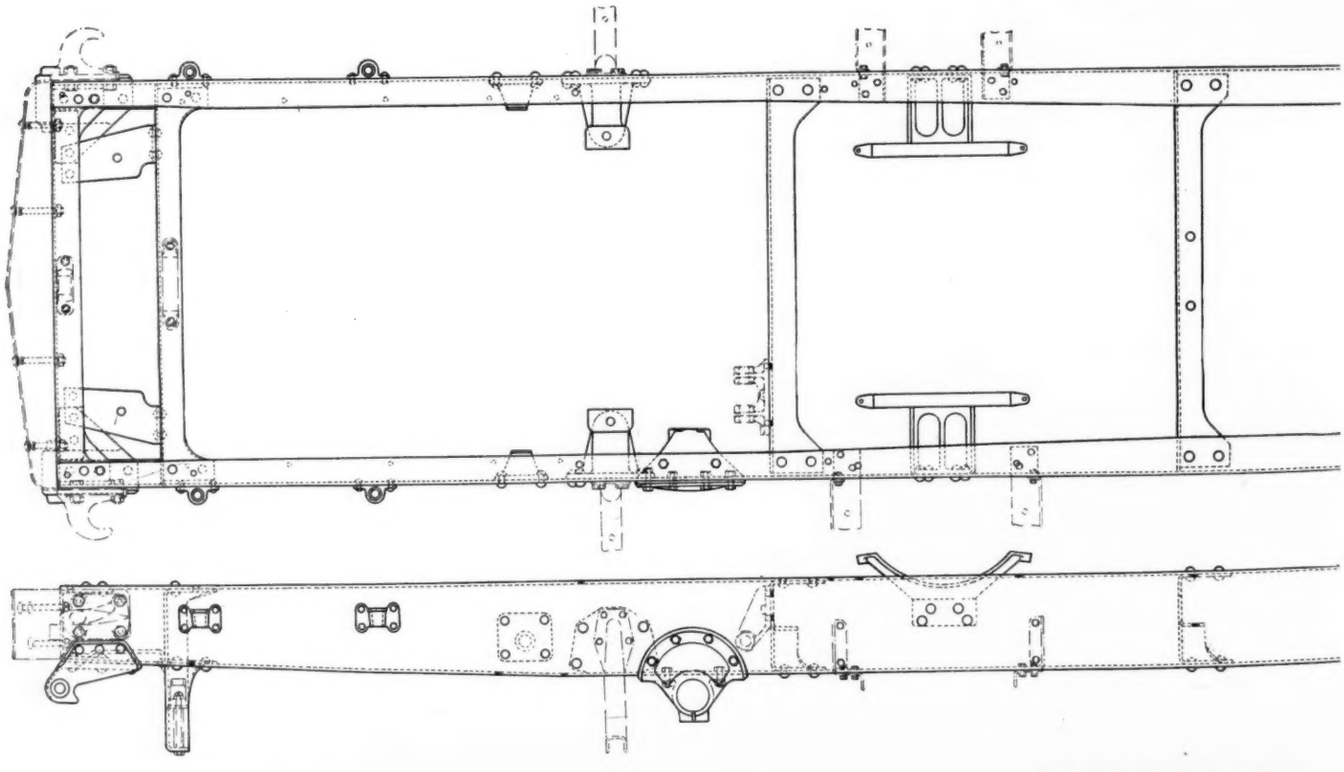
Five to six ton job is equipped with new Continental engine which develops 50 hp. at 1100 r.p.m. and has full pressure lubrication. Other equipment includes lighting generator, vacuum fuel feed, Eisemann magneto, Pharo governor, hub odometer and Alemite grease attachments.

By J. Edward Schipper

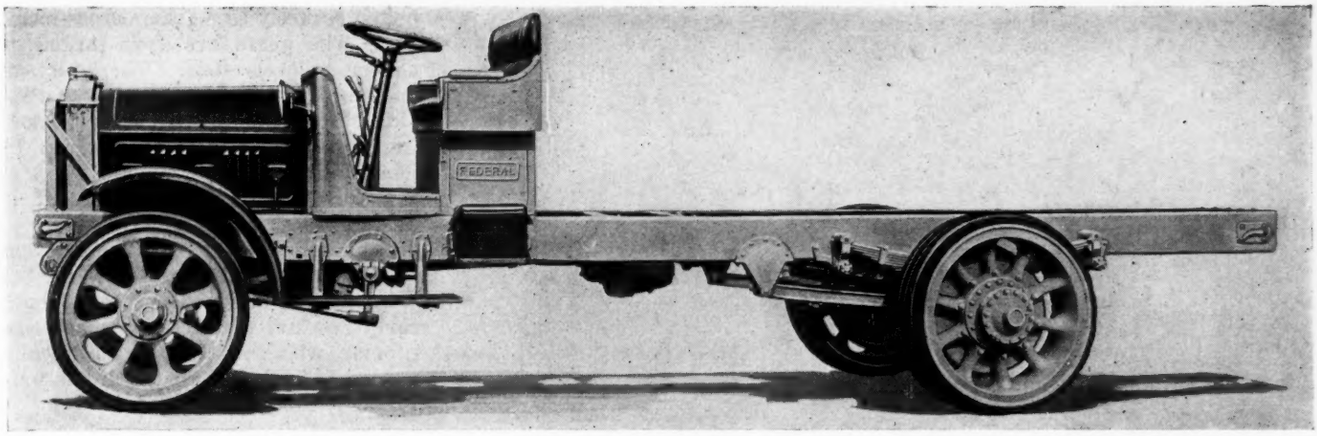
A NEW 5 to 6-ton Federal truck, incorporating a number of features of advanced design, is about ready for the market. As compared with the older 5-ton Federal, the new truck has a larger engine, the displacement being 425 instead of 350 cu. in. This engine has a removable instead of a fixed cylinder head, larger crankshaft bearings and full pressure oil feed instead of circulating splash. Electric lights and horn are furnished in place of oil lamps and a hand horn, and provision is made for an electric starter. The truck has a 14-in. instead of a 12-in. clutch, a larger propeller shaft, a heavier frame and a heavier transmission, with less reduction in the rear axle and increased reduction in the transmission, thereby attaining greater speeds in high gear without sacrifice of power in the lower gears. The new truck also comes with better equipment, being provided with four towing hooks, vacuum feed in place of gravity, and a hub-odometer.

The engine used is a new Continental model. It has been designed particularly for heavy work, being a four-cylinder, 4¾ by 5 in. design, developing 50 hp. at 1100 r.p.m. The cylinders are cast in pairs with removable heads. One of the features of the cylinder castings is the exceptionally large water jacket, the depth of which is even noticeable from the outside, giving a rather fully rounded casting. The crankcase is of aluminum, and the aluminum oil pan is bolted to it. The flywheel housing is cast integral with the crankcase and oil pan. The engine has a three-bearing crankshaft, 2⅝ in. in diameter. The end thrust of the crankshaft is taken on the front bearing and an adjustment for end play is provided. The reciprocating parts are completely machined for balance, and both the pistons and connecting rods are of extra length to reduce side thrust per unit of bearing surface on the cylinder wall. Each piston is equipped with four ¼ in. piston rings.

The gear train at the front end of the engine consists of four instead of the conventional three gears. The



Plan and side view of frame



New Federal 5-6 ton truck, which is generally heavier and more powerful than the former 5-ton Federal.

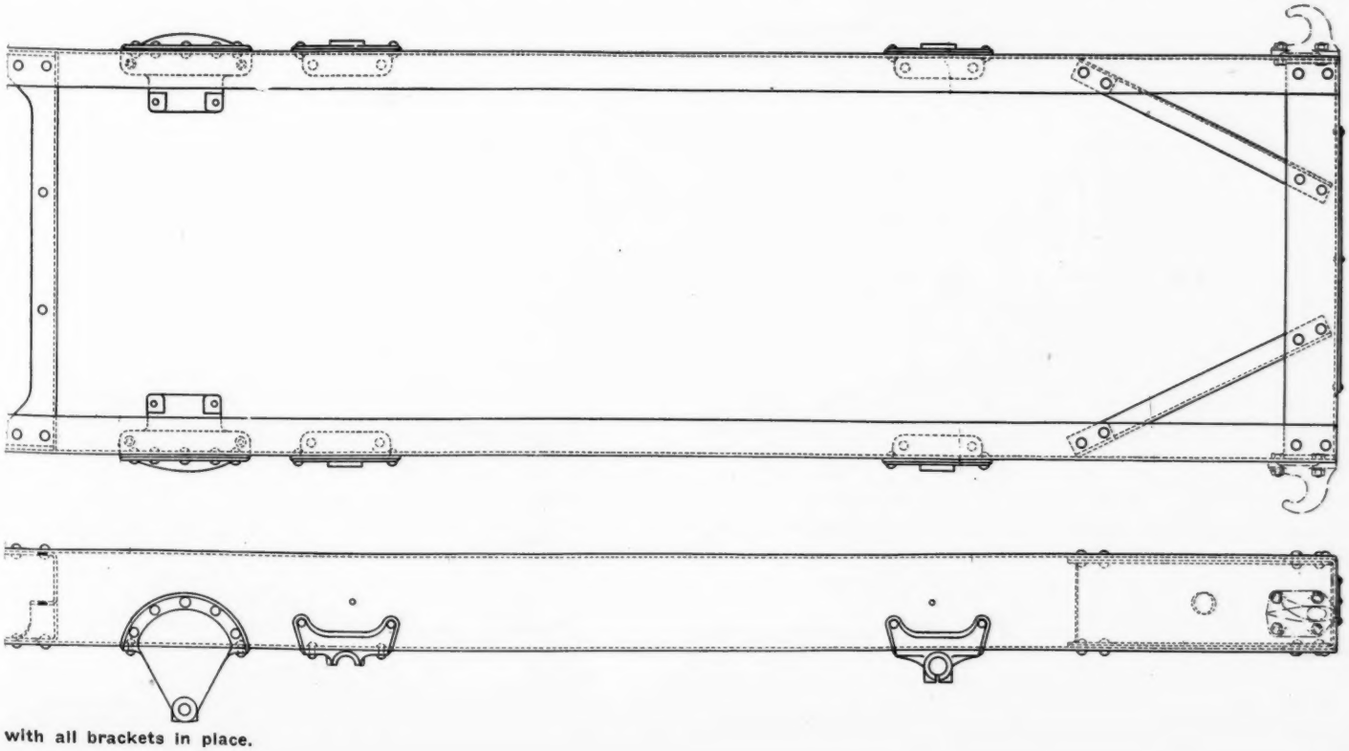
use of an idler gear between the cam and pump gears and the crank gear makes it possible to distribute the accessories, such as the pump, generator and magneto, so that they can be accessibly installed. Three bearings are employed for the crankshaft, which is 1¼ in. in diameter between the cams. It is machined and ground on special machines and the diameter of the camshaft at the bearing is greater than the height of the cam, to permit the removal of the shaft without disturbing the bearings. The valves are on the right side of the engine and are 2 1/32 in. in diameter. The valve stem diameter is 7/16 in.

Cooling is provided for by centrifugal water pump so mounted that there is ample room for taking up and replacing shaft packings. The pump is on the left side of the engine on the water pump and magneto shaft, which are driven off the same gear which supplies the drive to the fan pulley.

Full pressure feed oiling is secured by a gear pump, driven by spiral gears from the camshaft. The oil pump draws oil through a strainer in the oil pan. From this pump oil leads run to all the main bearings and the timing gear case. The crankshaft is drilled to supply oil to the connecting rod bearings, and an oil duct carries the oil from the lower end of the connecting rod to the piston pin bearing.

An oil pressure adjusting valve is built into the engine and the oil level in the pan is determined by the use of the conventional bayonet or stick type of gage. A pressure gage located on the dash of the truck indicates the pressure under which the oil is circulating. The oil which feeds the pump is strained by a non-clogging type of strainer which is carried in the oil pan.

The fuel system comprises a pressed steel tank of two pieces electrically welded together and tinned to make it rustproof. It rests in a malleable iron saddle held by straps. Gasoline is fed from this to the engine by means of the Stewart vacuum system. The carburetor is a Zenith 1½-in. model L-6. Ignition is by an Eisemann magneto Model G4, mounted on a bracket on the crankcase and driven through the pump shaft. An impulse starter is stock equipment. The governor is the



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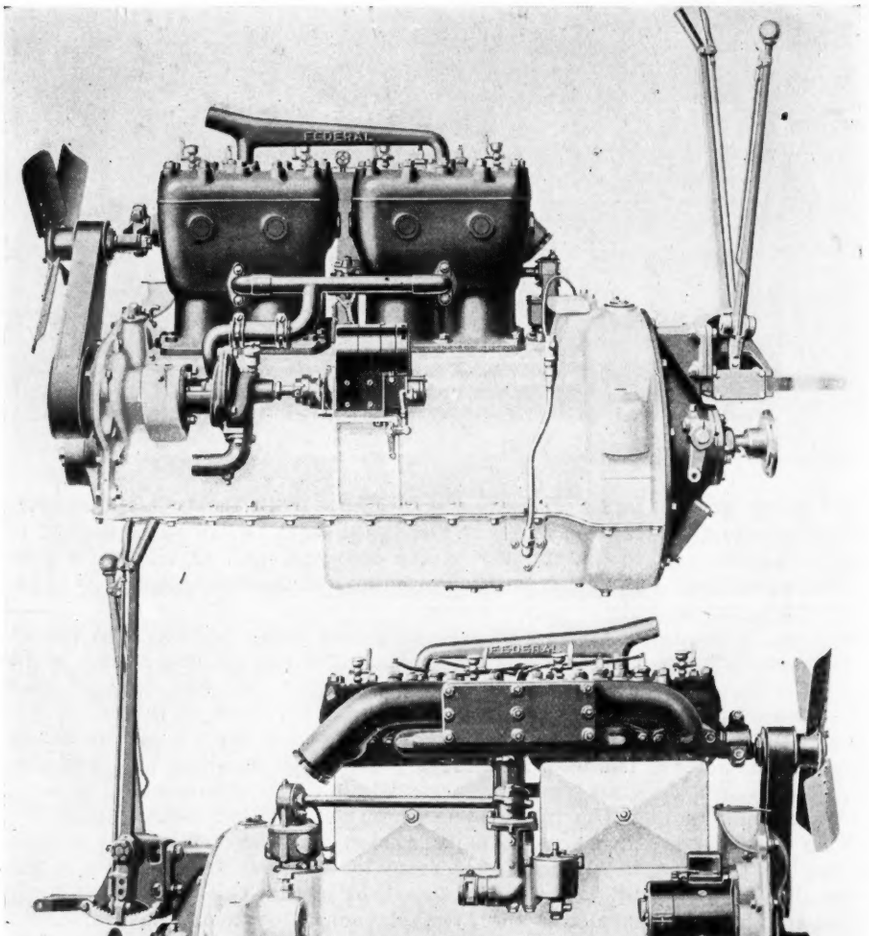


Two views of the new Continental 4-4¾ x 5 in. truck engine fitted to the new Federal truck.

Pharo, a centrifugal device using oil as the medium subjected to centrifugal force. The pressure of the oil raises a piston, which closes a butterfly valve in the intake pipe.

Three-point suspension is used for the engine, the front end being supported by a circular trunnion cast integral with the timing gear case and resting in a saddle bolted to a cross member. The two rear engine arms are supported on brackets riveted to the frame members. One of the rear arms is flexibly mounted by means of a coiled spring used in connection with the hanger bolt.

A Borg & Beck clutch 14 in. in diameter is fitted. The clutch shaft is 1¾ in. in diameter and is milled with 10 splines. Throw-out thrust is taken by a ball thrust bearing. The clutch shaft is mounted on two ball bearings and lubrication of these bearings and the throwout sleeve is provided for by a drilled clutch shaft through which grease is forced to the bearings.

The four forward and one reverse speed ratios of the transmission are as follows: High, 1 to 1, third, 1.75 to 1; second, 3.22 to 1; first, 5.85 to 1, reverse, 6.8 to 1. The gearset is mounted amidships and is supported at three points, two in the rear and one at the front. The front support is flexible, while the two rear supports are bolted securely to a frame cross-member. The gears are drop forged of chrome nickel steel. There is an opening on the side of the transmission case, through which, by removing a plug, the transmission can be filled with oil.

Provision for a power take-off is made on both sides of the case. The drive shaft between the clutch and transmission and that between the transmission and rear axle, both carry two universals. The shafts are tubular, with forged stubs electrically welded to each end to which the universal joints are attached.

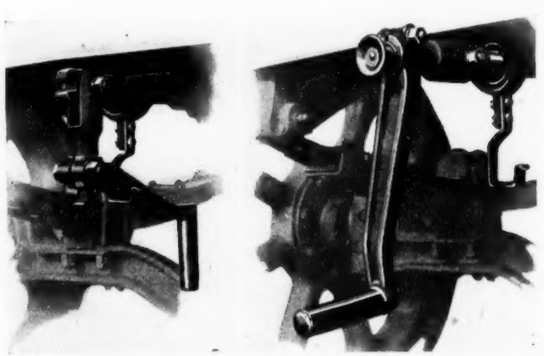
Pressed steel channels with a section 9 in. deep by 9/32 in. thick are employed for the frame. The latter is reinforced at all corners and at the junction of the frame cross-members is provided with heavy gusset plates. The frame is hot riveted and all the rivet holes are drilled. The truck is made in three chassis lengths with wheelbases of 163 in. on two of them and 187 on the third. The two with the 163-in. wheelbase have loading spaces of 130 in. and 154 in. respectively. The 187-in. wheelbase chassis had 190-in. loading space. These trucks all have the same over-all length of the frame, 222 in.

A Gemmer steering gear is employed and the control levers for the spark and throttle are mounted on the steering post. The steering gear, clutch, pedal and service brake pedal are on the left side. The gear shift lever and the emergency brake lever are mounted in the center.

The 5 to 6-ton model is equipped with generator, 6-volt battery, two side lamps with diffusing lenses and a tail lamp. A feature of the equipment is the mounting of the tail lamp in a recess of the rear frame member and of the license plate on the rear frame in such a way that it is illuminated by the tail light.

The axles are Timken type, mounted on roller bearings throughout. The rear eye of the front spring is slightly lower than the front eye, thus providing a caster effect. The rear axle is a full floating worm type,

(*Continued on page* 1205)



Folding starting crank on Federal truck, in folded and operating positions.

A Possible Explanation of Airplane Accidents Attributed to Engine Trouble

Formation and collection of snow in inlet manifold is known to cause throttling and erratic engine action. The trouble can be remedied by slightly heating the incoming charge with but slight loss in power.

By Stanwood W. Sparrow*

WHEN the daily paper tells that a plane has crashed, and states a definite cause such as the fracture of a fuel line or the collapse of a wing, public confidence in the safety of aviation is shaken. It is easy to believe, however, that defects so glaringly revealed will be corrected at once. The real blow to aviation comes when no satisfactory explanation for the accident is forthcoming. Knowledge of what is wrong must precede any intelligent effort to make a thing right. A wrecked plane bearing mute testimony to the existence of a fault and a confession of ignorance as to the nature of the fault tends to contradict assertions that aviation has outgrown the experimental stage. To bring attention to one possible cause of such unexplained accidents this note has been prepared for the National Advisory Committee for Aeronautics.

In testing airplane engines at the Bureau of Standards it has happened frequently that engine performance became erratic when the temperature of the air entering the carbureter was between 0 deg. C. (32 deg. Fahr.) and 20 deg. C. (68 deg. Fahr). Investigation revealed the trouble to have been caused by the formation and collection of snow somewhere between the entrance to the carbureter and the manifold, probably at the throttle. Experiments in the carbureter test plant had shown the possibility of this trouble. In fact, a glass portion of the induction system made it possible for one actually to see the snow as it collected.

Proof scarcely less convincing was obtained during engine tests. That something was wrong became apparent from a drop in power. The manifold depression, the difference between atmospheric pressure and the pressure in the manifold, was greater than that usually obtained at full throttle at this speed. At the same time, measurements showed the rate of air flow to be lower than usual. Inasmuch as both of these effects would be produced by throttling the engine, they gave a clue to the source of trouble. In some cases the snow would continue to collect until it shut the engine down, while at other times after it had effected a decrease in power of from 25 to 50 per cent a portion would become dislodged and the engine would speed up. The test apparatus is arranged so that the air on its way to the engine passes over heating grids. If, while the power was still low, sufficient heat was applied to increase the air temperature 20 deg. C. (36 deg. Fahr.) the power, manifold depression and air flow would soon regain their normal values. A few rather violent fluctuations of speed usually accompanied this period and can be attributed to the water passing into the combustion chamber as the snow melted.

Granting this trouble to be caused by the condensation of moisture from the air and the subsequent formation of snow, the removal of the moisture should prove as effective a cure as an increase in temperature. Fortunately it was possible to do this and thus check the validity of this supposition as to the origin of the trouble. The engine test apparatus includes refrigerating coils which enable all the air taken by the engine to be cooled to below —20 deg. C. (—4 deg. Fahr.). This air is then reheated to the desired temperature. Air when cooled to —20 deg. C. (—4 deg. Fahr.) contains almost no moisture and no opportunity is offered for it to collect any during its passage from the heating grids to the engine. Under these conditions, the engine operated satisfactorily at these temperatures at which difficulty was experienced with the air from which the moisture had not been removed.

The more serious the manifestations of this trouble, the more difficult it becomes to secure accurate data for record. Fluctuations of speed are violent and a stalled engine is usually the final result. A record of a few instances where it was possible to hold the speed reasonably constant are given as examples of the trouble in its milder stages. On Feb. 14, 1921, with the engine operating at part throttle at 1800 r.p.m. it was noted that the power was decreasing. At 1:06 p. m. readings of carbureter air temperature and manifold depression showed the former to be 10 deg. C. (50 deg. Fahr.) and the latter 25.0 cm. (9.84 in.) of mercury. Heat was applied and at 1:08 p. m. the air temperature had risen to 38 deg. C. (100 deg. Fahr.) and the manifold depression had dropped to 6.8 cm. (2.68 in.). Again the temperature of the air was allowed to drop and again a drop in power and increase in manifold depression resulted. With the speed maintained at 1800 r.p.m., the throttle was opened wide and readings taken showing the air temperature to be 10 deg. C. (50 deg. Fahr.), the manifold depression 11.1 cm. (4.37 in.) and the brake horsepower 86. Within two minutes, the application of heat had resulted in dropping the manifold depression to 5.6 cm. (2.20 in.) and in raising the brake horsepower to 185. The foregoing results were all obtained at air densities corresponding to ground level. Similar conditions were found on Feb. 23, at an air density corresponding to an altitude of 5000 ft. with the engine operating at full throttle at 1600 r.p.m. With the air at a temperature of 30 deg. C. (86 deg. Fahr.), the manifold depression was 2.9 cm. (1.14 in.) and the brake horsepower was 156. Eight minutes after the heating was discontinued, the air temperature had become 8 deg. C. (46 deg. Fahr.), the manifold depression 5.1 cm. (2.01 in.) and the brake horsepower 120.

While in all of these instances it was a change in weight of charge that caused the drop in power, the mag-

*Of the Automotive Powerplant Section of the Bureau of Standards. This paper is issued as Technical Note No. 55 of the National Advisory Committee for Aeronautics.

nitude of the decrease may have been influenced by another factor, a change in mixture ratio. If a carbureter does not maintain the air-fuel ratio constant at reduced loads, any unintentional throttling involves a departure from the desired mixture quality as well as a reduction in mixture quantity. To the reader familiar with carbureters in which changes in the area of a small passage between the float chamber and throat effect the mixture ratio changes, still another source of danger has doubtless suggested itself. This danger is that a collection of snow may block the connecting passage and cause a serious change in air-fuel ratio.

Discussion thus far may have emphasized unduly loss of power instead of what is probably the more serious effect, excessive fluctuations in power. Under these conditions a pilot is in exactly the same position as though his engine were controlled by a lunatic, opening and closing the throttle at will. Yet, in case of an accident, before an examination could be made the snow would have melted, leaving no evidence to confirm the pilot's report of trouble.

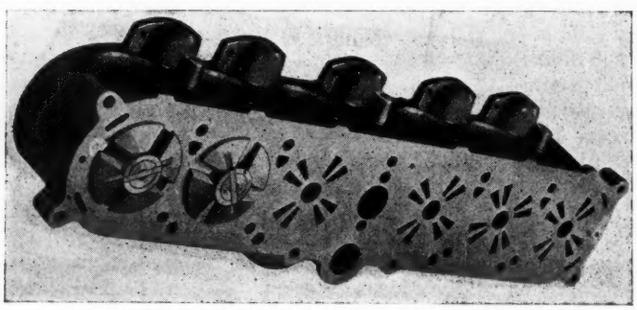
It is hardly worth while to attempt to predict from theoretical considerations at what temperature the trouble from snow formation will be most pronounced. It does seem desirable, however, to consider how much additional external heating is necessary to give reasonable assurance that the trouble will not occur. The weight of water vapor that a unit volume of air can contain decreases with decrease in temperature and the surplus condenses. Obviously if the drop in temperature be prevented there can be no condensation. The problem is to supply sufficient heat to completely vaporize the fuel so that no heat for this purpose need be withdrawn from the mixture. If the heat of vaporization of aviation gasoline be 75 cal. per gram (135 B.t.u. per pound)* complete vaporization will produce a drop in mixture temperature of 26 deg. C. (47 deg. Fahr.) with an air-fuel ratio of 10 to 1 and a drop of about 14 deg. C. (25 deg. Fahr.) with an air-fuel ratio of 20 to 1. It is safe to assume that the mixture ratio used will fall within these limits. The above calculation assumes all the fuel vaporized and all the heat used in vaporizing the fuel to be supplied by the mixture, while usually a portion of this heat is supplied externally. From these considerations it appears that the addition of an amount of heat sufficient to increase the mixture temperature 25 deg. C. (45 deg. Fahr.) should prove a reasonable guarantee of immunity from this trouble. The power loss that this would entail should not exceed 5 per cent.

This note is not intended as a sweeping recommendation of additional air heating for every airplane engine. Such a course would be akin to prescribing medicine for a patient without first being assured that he was really sick. The aim is to call attention to a "disease" to which aviation engines are subject, to describe its symptoms, and to emphasize its seriousness. Methods of prevention or cure can be consigned with safety to those vitally concerned.

*Ricardo, *Automobile Engineer*, February, 1921.

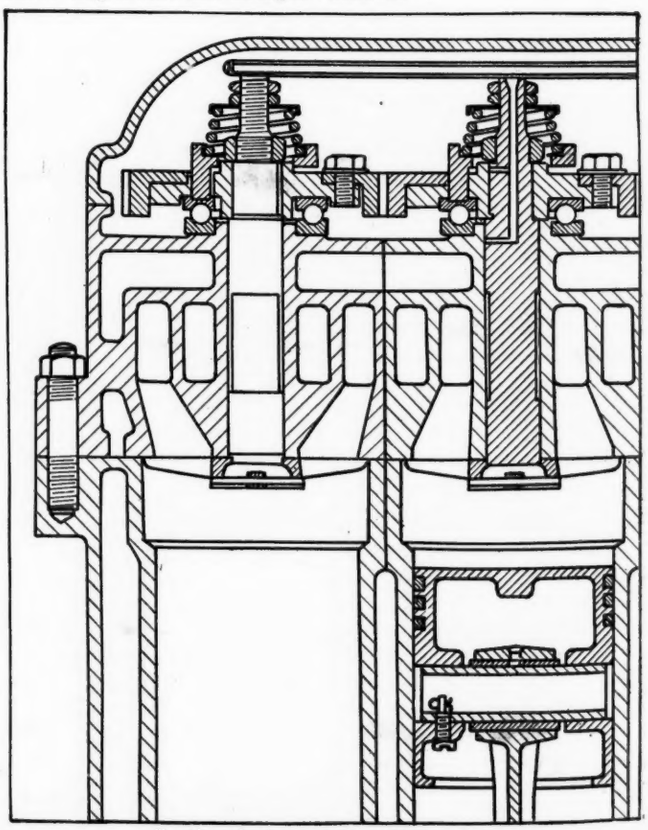
Disk Valve Engine Used in New Car

ONE of the passenger cars marketed for the first time this year is known as the Ace, and the principal feature of this car is the Guy rotary disk valve engine. The disk is located in the combustion chamber. It bears against the cylinder head and is provided with four radial, rectangular slots forming ports. In the cylinder head there are four corresponding inlet and four exhaust ports. As the inlet ports, for instance, are opened every time the slots in the valve disk register with the inlet ports in the cylinder heads, which happens four times during one revolution of the disk, and as they need to be opened only once every two revolutions of the crankshaft, the disks revolve at only one-eighth the crankshaft speed. This low speed of rotation seems to be the chief novelty. The inlet and exhaust ports are located adjacent to each other. Inlet and exhaust ports lead to two concentric passages with outlets on opposite sides of the cylinder head.



Head of Ace engine, showing Guy rotary disk valve

The claims made for this valve are that it insures better scavenging, gives a high low-speed torque, is self-cleaning and that lubrication is positive. It is said that a Guy disk valve used in an engine which was driven more than 50,000 miles showed less than 0.001 in. wear on the valve surfaces. Silent operation and freedom from warpage are other important advantages claimed.



Sectional view of Guy disk valve

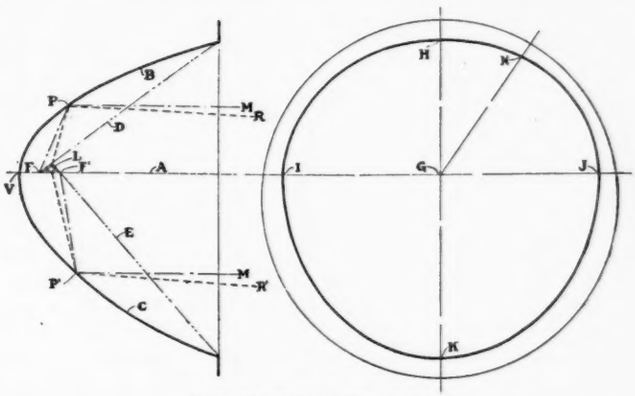
Devices for Controlling Headlight Glare

Specially shaped reflector designed to keep beam of light below eye level requires no special lens. Ford cars are now being regularly equipped with green visor lenses and device for focusing the bulb.

THE problem of controlling headlamp illumination so as to effect efficient lighting of the road ahead of the car and yet prevent annoyance by glare to people traveling in the opposite direction is still with us. Almost every conceivable means of attack has been made use of since the glare problem first became serious, about 1910. At first absorbing media, such as amber colored lenses, were used to quite an extent. Later came lenses of such formation as to break up or disperse the light beam, and finally it was decided that the proper principle to use was to control the direction of the beam of light, so it falls upon the road surface at a reasonable distance ahead of the car, but does not rise to a sufficient height to reach the eyes of the approaching pedestrian or vehicle driver. Use of the dispersion principle does not seem logical, for we first place behind and around the luminous source a carefully made reflector to gather the rays into a parallel beam and then place in front of the source a lens which breaks the beam up again before it has accomplished any useful purpose. The eyes of other users of the highway are always above the level of the headlights and the most logical plan seems to be to direct all the rays from the source downwardly. This can be done by use of lenses of prismatic form; it can also be done by giving the reflector a suitable shape, and this is perhaps the simplest method.

C. W. and C. H. Crockett have developed a reflector which permits of this desirable control of the beam of light. This reflector is in the form of one smooth continuous surface, but within the concavity of the reflector there is a space, in which the source of light may be placed, such that, when the light source is wholly in the space, all of the light falling on the reflector will be reflected either horizontally or in a downward direction.

The surface of the reflector is generated by revolving, about its horizontal axis, a parabolic arc whose parameter

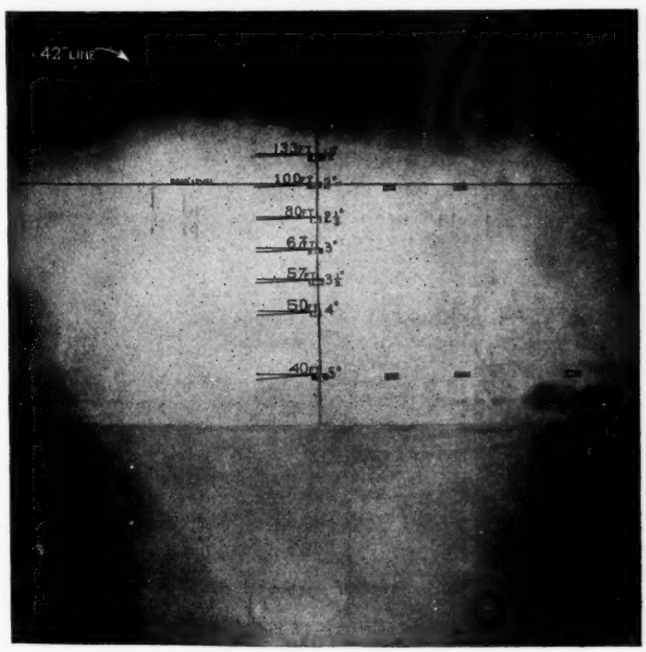


Crockett head lamp reflector.

gradually increases as the arc is revolved through 180 deg. from its upper vertical to its lower vertical position. Referring to the drawings, the plane *GH*, through the axis *A* and on one side thereof, will cut the reflector in a parabolic arc *B*; and any other plane *GN* through the axis *A* and on one side thereof, will cut the reflector in a parabolic arc having a parameter greater than that of the arc cut by the plane *GH*; and the parameter of the section will increase as the cutting plane passes from the position *GH* to the position *GK*, where the parameter of such an axial section will have its greatest value, the corresponding section of the surface being the parabolic arc *C*. Thus the sections of the surface, made by planes through axis *A*, are parabolic arcs, all having the common axis *A* and the common vertex *V*, the focus of each arc being situated on the axis *A* between *F*, which is the focus of the parabolic arc *B* and which is the focus nearest the vertex *V*, and *F'*, which is the focus of the parabolic arc *C* and which is the focus farthest from the vertex *V*.

The sections made by planes perpendicular to the axis *A* and in the form *IHJK*, which consists of two semi-ellipses, *IHJ* and *IKJ*, having a common center *G* and a common axis *IJ*, *GH* being less than *GI*, while *GK* is greater than *GI*.

If the reflecting surface is a right parabolic cylinder, whose intersection with the vertical plane through the axis *A* is shown in the curves *B* and *C*, and if a point of light *L* is placed above the horizontal axis *A*, and in the vertical plane through *A*, and forward of the line *D* drawn from the focus *F* to a point on the parabolic arc *B* which corresponds to the upper forward edge of the reflector, none of the rays of light falling on the upper portion of the surface will be reflected in an upward direction; for, if a point of light is situated at the focus *F*, any ray *FP* will be reflected in the direction *PM* parallel to the axis, and there-



Photograph of surface illuminated by beam from Crockett reflector.

fore any ray LP from the light L will be reflected in the direction PR—downward. Again, if a point of light L is placed above the axis A, and in the vertical plane through A, and to the rear of the line E intersecting the focus F' and extending to a point on the parabolic arc C which corresponds to the lower forward edge of the reflector, none of the rays of light falling on the lower portion of the surface will be reflected in an upward direction; for, if a point of light is situated at the focus F', any ray $F'P'$ will be reflected in the direction $P'M'$ parallel to the axis, and therefore any ray LP' from the light L will be reflected in the direction $P'R'$—downward. Hence, if a point of light L is placed above the axis, and in the vertical plane through the axis and forward of the line D and to the rear of the line E, that is, if it is placed in the shaded triangle whose base is FF', none of the light falling on any portion of the surface will be reflected in an upward direction. But there will be upward reflection if any part of the source of light is outside of this triangle.

When the surface is one of double curvature, as it is in all reflectors, the direction of the reflected ray is not easily determined, but somewhat similar conclusions are true for the Crockett reflector. There is a limited space, projected in the shaded triangle bounded by the lines D, E and A, such that, if the source of light is contained entirely within this space, none of the rays of light will be reflected in an upward direction. But there will be some upward reflection if any part of the light source is outside of this space.

A test of this reflector was made by the Electrical Testing Laboratories of New York City using a Mazda B headlamp bulb of 18 spherical candle-power. The maximum beam candle-power was 11,000. The photographic record of this test is reproduced herewith, and it will be seen that there is no light above the 42 in. line. The reflector is said to meet the anti-glare provisions of the laws of New York, New Jersey and Massachusetts. With a reflector of this type a plain glass lens can be used, and it is believed that this reflector affords the least expensive means of dealing with the troublesome glare.

Ford Green Visor Lens

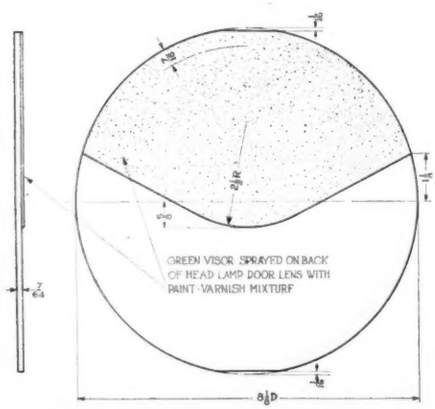
FORD cars are now coming through regularly equipped with non-glaring head lights known as the Ford green visor head lamps, installation of these head lamps having started in March. The Ford company has also placed on sale replacement lenses for the cars already in use. The new head lamp has been tested and approved in the states of Connecticut, New York, Pennsylvania, Maryland and Wisconsin, in the District of Columbia and in the city of Detroit, and tests are at present being conducted in California.

According to the Ford Motor Co., this device has been adopted in an effort to provide a head lamp which will give ample light for driving and at the same time eliminate glare.

The diagram herewith shows the illumination obtained in the New York tests and indicates that the equipment complies with both the light and anti-glare requirements. The new lamp comprises the standard Ford parabolic reflector of 1⅜ in. focal length. The lens has the upper part painted green. The visor extends ⅝ in. below the center of the lens and is tapered back to a distance of 1⅛ in. above the center line at each side. A special double filament bulb is supplied carrying a helical major filament, closely wound and 7/32 in. in length. This filament is specially focused with the filament drawn back of the focal center of the reflector until the front end of the filament is at the focus. The tip of the filament being at the focal center gives the direct beam required, while the remainder of the filament behind the center distributes light to the sides of the lamp.

Standard adjusting directions have been supplied all dealers. A shop layout for focusing and aligning the lamps is shown in the sketch herewith. The empty car is put on a level surface in front of a white wall or screen 25 ft. from the front of the head lamps. This wall must be in semi-darkness or sufficiently shielded from direct light to enable the light spots upon it from the head lamps to be clearly seen. The bright lights are turned on and the lamps focused by means of the screw at the back of the lamps, first one lamp and then the other, drawing the bulb filament slightly back of the focal center of the reflector until a semi-circular spot of light is obtained on the wall, with the flat side up and with a concentrated circular central portion. In focusing the bulb is drawn back to obtain as wide a spread as possible and still maintain the approximately flat top line and the concentrated central portion. In general, the spot of light when properly focused will measure about 5 or 6 ft. across the top.

In aligning the head lamps the brackets are bent so that the top lines of the bright spots on the wall are set at a line 28 in. above the level of the surface on which the car stands. The half cone of light from each head lamp is to extend straight forward; that is, the centers of the concentrated circular portions must be 28 in. apart. In assembling at the Ford plant, this is the last step taken before the cars leave the line.



Ford Green Visor Head Lamp showing dimensions and location of visor.

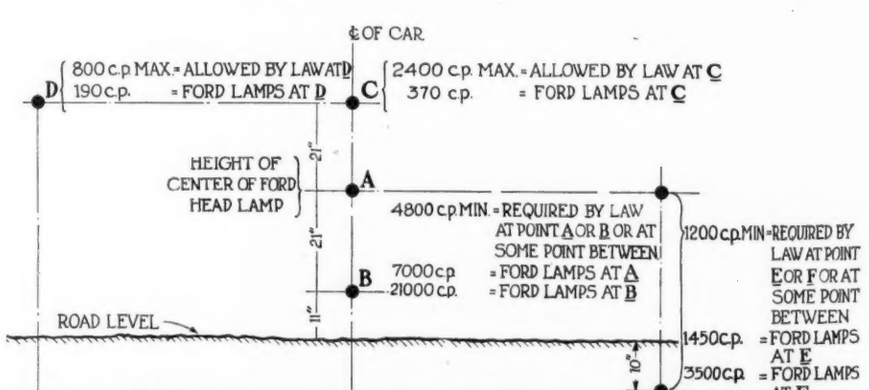

℄ OF CAR
800 c.p. MAX. = ALLOWED BY LAW AT D
190 c.p. = FORD LAMPS AT D
2400 c.p. MAX. = ALLOWED BY LAW AT C
370 c.p. = FORD LAMPS AT C
HEIGHT OF CENTER OF FORD HEAD LAMP
21"
21"
11"
4800 c.p. MIN. = REQUIRED BY LAW AT POINT A OR B OR AT SOME POINT BETWEEN
7000 c.p. = FORD LAMPS AT A
21000 c.p. = FORD LAMPS AT B
1200 c.p. MIN. = REQUIRED BY LAW AT POINT E OR F OR AT SOME POINT BETWEEN
1450 c.p. = FORD LAMPS AT E
3500 c.p. = FORD LAMPS AT F
ROAD LEVEL
10°
7 FEET
7 FEET

Diagram of Ford Head Lamp Illumination.

An Analysis of Elements Which Govern Automobile Fuel Economy

Part I

A paper containing much useful information in regard to the factors which determine rolling resistance, frictional and other losses which are encountered in converting the heat in fuel burned in the engine into tractive effort at the periphery of the driving tires.

By W. S. James*

AN attempt has been made, first, to analyze and state the factors effecting the power requirements of cars; second, to analyze and state the factors affecting the amount of power supplied the car as fuel to produce at the road the power required for transportation.

The power required to propel rubber-tired vehicles over roads is delivered to the road by the wheels as thrust or tractive force which is used (*a*) to overcome wind resistance, (*b*) to overcome the resistance to the rolling of rubber-tired vehicles, (*c*) to produce linear acceleration of the car masses and angular acceleration of the wheels and (*d*) to overcome gravity deceleration when climbing hills.

The thrust or tractive force required to overcome wind resistance is proportional to the projected frontal area of the car and to the square of the velocity of the car relative to the air.

$$F = CAV^2$$

where A = area in sq. ft., C = constant of proportionality, F = force in lb. and V = velocity in miles per hr.

The constant of proportionality C varies with the type of body and no reliable information seems to be available on the effect of changes in body shape on this figure. Values of C vary from 0.0030 to 0.0042 according to various authorities. The measurement of the projected frontal area of 17 different representative makes of car gave an average value of 26 sq. ft., the minimum being 24 and the maximum 30 sq. ft.

The thrust or tractive force required to overcome the road resistance to rolling of rubber-tired vehicles is nearly independent of speed (see Table 1) and depends on (*a*) the weight of the vehicle, (*b*) the character of the road surface, (*c*) the construction of the tires, (*d*) the inflation pressure of pneumatic tires and (*e*) on the type of wheel bearings. The rolling resistance of rubber-tired vehicles over different types and conditions of road surface varies widely. Values of this resistance according to various authorities run from 9 to 19 lb. per 1000 lb. of car weight on hard smooth concrete asphalt, wood or macadam, and may reach 150 to 250 lb. in sand. There is little information available as to the effect of tire construction on rolling resistance. For a given car weight the variation in road surface resistance is by far the most important item to consider in the reduction of rolling resistances.

*Associate physicist at the Bureau of Standards, Washington, D. C. Condensed from a paper presented at the Semi-Annual Meeting of the Society of Automotive Engineers.

The tractive force required to give a linear acceleration to the mass of the car and an angular acceleration to the wheels is directly proportional to the weight of the car and the weight and moment of inertia of the wheels. The force required to accelerate the wheels is about 2 to 4 per cent of the total tractive force and can be neglected.

TABLE 1—RESISTANCE TO ROLLING OF PNEUMATIC-TIRED VEHICLES AT VARIOUS SPEEDS

Speed, M.P.H.	Wheel Resistance per 1000 Lb. Car Weight Lb. Total	Front Tires	Front Windage	Rear, Total	Total for Car
		30-Hp. Renault			
6.2	5.4	4.5	0.9	...	...
12.4	5.4	4.5	0.9	17.9	23.3
18.7	5.7	4.5	1.2	16.7	22.4
24.9	6.1	4.5	1.6	14.3	20.4
31.1	6.3	4.5	1.8	12.9	19.2
37.3	6.8	4.6	2.2	14.5	21.3
43.6	7.4	4.6	2.8	17.1	24.5
		40-Hp. Daimler			
6.2	6.4	5.6	0.8	...	...
12.4	6.4	5.6	0.8	...	...
18.7	7.0	5.9	1.1	16.6	23.6
24.9	7.3	5.7	1.6	17.3	24.6
31.1	7.7	5.8	1.9	17.4	25.1
37.3	7.8	5.4	2.4	18.0	25.8
43.6	8.6	5.8	2.8	18.9	27.5
49.7	9.0	5.8	3.2	18.3	27.3
		Mercedes Electric			
6.2	7.4	..	..	14.5	21.9
12.4	7.9	..	..	14.7	22.6
18.7	8.4	..	..	15.8	24.2
24.9	8.9	..	..	17.9	26.8
31.1	9.2	..	..	21.5	30.7
		45-Hp. Bussing Motor Truck			
6.2	3.8	..	..	13.7	17.5
9.3	4.8	..	..	13.3	18.1
12.4	5.3	..	..	13.7	19.0
15.5	5.9	..	..	14.4	20.8
		100-Hp. Benz Racing Car			
31.1	7.1	..	..	24.0	31.1
43.6	7.6	..	..	30.0	37.6
55.9	5.9	..	..	31.0	36.0
68.4	10.4	..	..	31.0	41.4
80.7	13.6	..	..	31.0	44.6
93.3	14.0	..	..	29.0	43.0
		75-Hp. Adler Racing Car			
24.9	10.7	..	..	34.7	45.4
37.3	10.7	..	..	35.6	46.3
49.7	10.7	..	..	38.7	49.4
62.1	12.8	..	..	36.3	49.1
74.7	10.7	..	..	36.5	47.2

Tires	Inflation-Pressure, Lb. per Sq. In.	Speed, M.P.H.	Rolling Resistance of Front Wheels per 1000 Lb. of Car Weight, Lb.
Car A—32x4 Silvertown Cord	60	20	10.4
		30	10.4
		40	12.3
Car B—32x4 Plain Fabric	55	21	21.1
		27	21.8
		34	20.5
		41	21.3
Car C—35x5	60	21	15.7
		27	16.0
		34	16.3
		41	16.1

An acceleration of from 3 to 4 ft. per sec. per sec. is usually demanded in good performance, but accelerations as high as 5 and 6 ft. per sec. per sec. are very uncomfortable for passengers. The tractive force required per 1000 lb. of car weight for several rates of acceleration, including an additional force of 3 per cent for wheel accelerations, is given in Table 2.

TABLE 2—TRACTIVE FORCE REQUIRED FOR ACCELERATION

Acceleration, ft. per sec. per sec.	Tractive Force, per 1000 Lb. of Car-Weight, lb.*
0.5	16
1.0	32
1.5	48
2.0	64
2.5	80
3.0	96
3.5	112
4.0	124

*An additional 3 per cent is assumed for wheel acceleration.

The tractive effort required to overcome grades is equal to the product of the car weight, gravity acceleration and the sine of the angle of grade. For grades less than 14 per cent the per cent grade can be used in place of the sine of the angle with an inaccuracy of only 1 per cent. In cities the grades are kept below 10 per cent unless extraordinary conditions must be met. Tractive force per 1000 lb. of car weight for grades up to 14 per cent is given in Table 3.

TABLE 3—TRACTIVE FORCE REQUIRED TO OVERCOME GRADES

Grade, per cent	Tractive Force per 1000 Lb. of Car-Weight, lb.
1	10.0
2	20.0
3	30.0
4	40.0
5	50.0
6	59.9
7	69.8
8	79.7
9	89.7
10	99.6
11	109.4
12	119.3
13	128.5
14	138.6
15	148.0

The power or tractive effort required for acceleration and hill-climbing are performance requirements independent of the road surface and wind-resistance. They can be considered as one power-demand interchangeable in application as both are essential accelerations and seldom demanded at the same time. The only point of difference lies in the fact that hill-climbing does not necessarily involve wheel acceleration. This item is small and for the purposes of this illustration can be neglected.

To illustrate the relation existing between the three major power demands, wind resistance, road rolling resistance and acceleration, the characteristics of the average 1921 American car have been computed and the results are given in Table 4. It will be noticed that the tractive force available to overcome wind and road resistance and produce acceleration varies less than 4 per cent over the driving range of speeds from 10 to 35 m.p.h.; that the tractive force available to overcome rolling resistance and produce acceleration varies more than 25 per cent over the same range of speeds; and further that grades of from 9 to 4.5 per cent can be negotiated at speeds from 20 to 35 m.p.h., dependent on the road resistance to rolling. If the car characteristics chosen are representative of the present American product meeting the demands of the driving public, the performance demands of the public are in no way unreasonable with our roads as they are to-day.

Fuel conservation from the point of view of power demands of the car would be greatly furthered by a sound, far-sighted good roads program. The power demands to overcome grade and high average rolling resistance would not only be reduced but, more important still, car weights could be reduced without any sacrifice of constructional sturdiness. Any reduction in car weight means an almost proportionate decrease in the power required and therefore in the fuel to supply the power.

The processes involved in the production of power at the rear wheel rims from fuel supplied the engine may be divided into four main groups; (*a*) the preparation of an explosive mixture of fuel and air, (*b*) the transformation of the chemical energy latent in the explosive mixture into gas pressure, (*c*) the transformation of the gas pressure produced into crankshaft torque and (*d*) the transformation of crankshaft torque to thrust at the road surface.

The preparation of an explosive mixture of air and fuel involves three major factors; (*a*) proportioning the proper weight of air to a given quantity of fuel, (*b*) mixing the fuel and air as intimately as possible, and (*c*) controlling the weight of combustible mixture used in a unit of time.

In proportioning the air and fuel it is important to know the limiting values of the ratios of weight of air to weight of fuel which will explode under cylinder conditions. There are some data available on this subject but they are inadequate.

TABLE 5—EXPLOSIVE RANGE OF MIXTURES OF GASOLINE VAPOR AND AIR

Initial Temperature, deg. fahr.	Lean Explosive Limit
73	23 to 25
392	25 to 27
572	30 to 31
752	31 to 37

TABLE 4—ROAD CHARACTERISTICS OF THE AVERAGE 1921 AMERICAN CAR

Car Speed, M.P.H.	Available Engine Effort[1] per 1000 Lb. of Car-Weight, Lb.	Air-Resistance[2] per 1000 Lb. of Car-Weight, Lb.	Thrust Available[3] for Road-Resistance and Acceleration per 1000 Lb. of Car-Weight, Lb.	Thrust Available for Acceleration with Road-Resistances per 1000 Lb. of Car-Weight of 10 Lb.	20 Lb.	30 Lb.
15	107.3	4.9	102.4	92	83	70
16	105.2	1.8	103.4	93	83	73
20	107.6	8.8	98.8	89	79	69
25	106.0	13.4	92.6	83	73	63
30	103.9	19.2	84.7	75	65	55
35	101.2	26.0	75.2	65	55	45
40	98.0	34.1	64.9	55	45	35
45	94.1	43.4	50.7	41	31	21
50	86.8	53.8	33.0	22	12	2

[1]The data used in this computation were a maximum of 33 hp. at 2270 r.p.m.; a transmission and rear-axle efficiency of 85 per cent; the torque-speed curve was proportional to that given in a paper by A. L. Nelson, published in AUTOMOTIVE INDUSTRIES for Jan. 27, 1921; 32-in. tires; a rear-axle ratio of 4.42 to 1; a car-weight of 3096 lb. without any load and a passenger weight of 750 lb.

[2]Projected frontal area of car 26 sq. ft. The division of the total car resistance by the car-weight does not mean that the air-resistance varies with the car-weight. It was done for ease of comparison with the available thrust and road-resistance for 1000 lb. of car-weight.

[3]Ten pounds tractive force per 1000 lb. of car-weight is nearly equivalent to the tractive force required to move 1000 lb. up a 1 per cent grade.

In an engine cylinder the explosive charge is diluted by the products of combustion from the previous working stroke. At the end of the exhaust stroke there remains in the clearance volume an almost constant weight of exhaust gas irrespective of the engine speed and load. As the weight of unburned charge taken in decreases with any decrease in the load, the percentage of exhaust gas dilution increases. The effect of inert gas dilution on explosive range of gasoline-air mixtures has not been extensively investigated. Fig. 1 is drawn from admittedly meager data on this subject. It indicates that the less the stratification or the greater the turbulence of the cylinder contents, the richer the leanest mixture which will fire regularly must be. From the viewpoint of fuel economy, the lean explosive limit of the mixture of air, fuel and exhaust gases in the cylinder at ignition sets a maximum limit of leanness and, therefore, thermal efficiency unless charge "stratification" is resorted to.

Within the explosive proportion limits there are two mixture proportions which are interesting from the point of view of internal combustion engines and one from an academic viewpoint. These are (*a*) maximum economy mixtures, (*b*) maximum power mixtures and (*c*) chemically "correct" mixtures. Excellent experimental work has been done by several observers on maximum economy mixtures, and it is concluded that the mixture for maximum economy is the leanest mixture on which the engine will fire regularly, usually about 16 to 1. Mixture ratios for maximum power development have also been carefully studied, and found to be practically independent of speed and load and to vary from 11 to 1 to 13 to 1.

Effect of Mixture Proportions

If equal proportions of each of the 10 compounds of the paraffin series be mixed in a single fuel and chemically correct mixture ratio of the average would be incorrect for the lightest or heaviest component by only 1.2 per cent. Similarly such a mixture for the aromatics would be incorrect by 3.5 per cent, for the acetylenes 1.3 per cent and always correct for the olefines.

It will be noticed that the maximum economy mixtures are leaner and the maximum power mixtures are richer than the chemically correct mixtures. The presence of exhaust gases, the law of mass action and the limited time available for the completion of the reaction would explain why all three mixtures are not the same. At the present time our knowledge of the relations between these factors is insufficient. In a cylinder of fixed dimensions, as the oxygen occupies a greater volume than the fuel vapor it must be entirely consumed to obtain the maximum power. To accomplish this in the shortest possible time an excess of vapor must be present. In the same way when all the fuel is to be consumed as in the case of maximum economy mixtures, excess air must be present.

To indicate what the variation in the mixture ratio with changes in the speed and the load is with present carbureters, several makes of stock carbureters, representing at least 60 per cent of the total number of carbureters in use to-day, have been tested in the carbureter test plant at the Bureau of Standards. The results show that there is little agreement among carbureter manufacturers as to the variation of mixture ratio requirements with changing loads and speeds.

The average mixture ratio, computed from exhaust gas analysis, supplied the engines of 23 average cars tested under winter conditions by the Bureau of Mines,* varied from 12 to 13.5, corresponding more nearly to maximum power than maximum economy.

*See Gasoline Losses Due to Incomplete Combustion in Motor Vehicles, by A. C. Fieldner, A. A. Straub and G. W. Jones, published in *Journal of Industrial and Engineering Chemistry*, vol. 13, p. 51.

Mixing and Vaporization

Insufficent fuel and air mixing is probably the source of the greatest fuel waste to-day. Poor distribution among cylinders and the need for over-rich mixtures when starting and accelerations are the result of insufficient mixing. Minute and thorough subdivision of the fuel is the solution of the mixing problem. The difficulties involved in attaining thorough mixing are realized when it is appreciated that (*a*) when liquid gasoline is injected into an airstream probably not more than a small percentage is ever vaporized before entering the engine cylinder except when the air in the manifold is heated; (*b*) a cube of liquid gasoline 0.1 in. on a side is all that is required to be mixed with a cube of air 2.1 in. on a side; (*c*) when the cube of gasoline is evaporated the vapor occupies a cube 0.6 in. on a side; and (*d*) from 0.1 to 1.0 sec. elapses from the time the liquid fuel leaves the carbureter jet until it is ignited within the cylinder. Subdivision of the fuel may be accomplished in two ways, (*a*) by vaporization or change in state, and (*b*) by minute subdivision of the liquid or atomization.

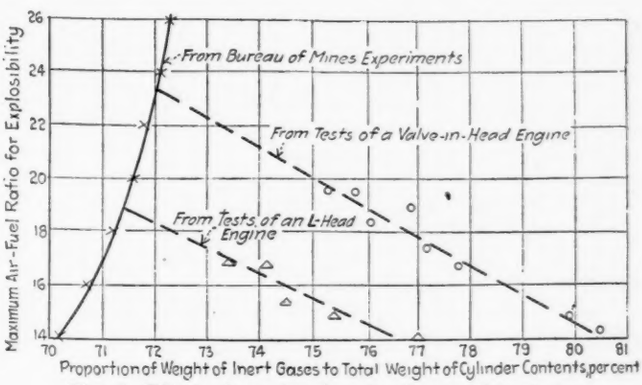


Fig. 1—Effect of an increase in the weight of the inlet gases on the maximum air-fuel ratio for explosibility.

Vaporization of the liquid fuel gives the most minute subdivision attainable. To vaporize the fuel a definite quantity of heat must be supplied per pound. The latent heat of vaporization and specific heats of the liquid for gasolines and some pure compounds found in liquid fuels are given in the series of articles by Ricardo published in recent issues of AUTOMOTIVE INDUSTRIES. Variation in the latent heat values are to be expected from the known variation in the composition of gasolines. Vaporized fuel occupies over 200 times the volume of the liquid fuel before vaporization, and in an explosive mixture the vapor volume represents from 1 to 2.5 per cent of the total volume of the charge.

Complete vaporization of the fuel would decrease the volume of air which could be admitted to a fixed cylinder; hence, the power of the engine by about 2 per cent. On the other hand, the cooling of the charge caused by such evaporation, if no heat were supplied the air from external sources, would contract the air by some 7 per cent, thus increasing the power output by this amount. Thus vaporization of the fuel causes a net increase in the power output, and the heating of the charge in the manifold, a decrease. The temperature required for complete vaporization is at least equal to the temperature at which the vapor pressure of the fuel equals its partial pressure in the explosive mixture. If this is more than about 20 deg. Fahr. above that of the entering air, a net loss of air volume will result.

Sufficiently fine atomization of the liquid fuel at the carbureter jet and subsequent vaporization within the cylinder during compression would accomplish the same

result as vaporization without the attendant loss of air volume and power output.

Charge Quantity Control

Three methods have been used to control the quantity of explosive charge used, namely, reducing (*a*) the manifold pressure but not the volume of the charge drawn from it which is the usual throttle control; (*b*) the effective time interval of inlet valve opening; but not the manifold pressure or what is known as variable inlet valve timing; and (*c*) the weight of the *combustible* charge but not the cylinder charge weight or the stratification and direct fuel injection method. In the first method the power required to pump the cylinder charge from the manifold to the exhaust pressure increases with a reduced load, thus reducing the economy with the load. At 20 per cent full load the loss in economy may amount to about 20 per cent. Exhaust gas dilution also increases with a reduction in the load and thus reduces the leanness of the mixtures which will explode. When variable inlet valve timing is used there is no increase in the "pumping loss" with a reduction in the load, and the exhaust gas dilution increases with a reduction in the load in the same manner as when charge throttling is used. However, mechanical complications are introduced. Results on a test of an engine using a late closing inlet valve show that at a little less than half load the fuel consumption was about 50 per cent less than that attained when using fixed valve timing and the usual throttle control. In the case where charge stratification is relied on entirely, "pumping loss" is entirely eliminated. As yet no commercial application of direct injection engines has been made to automobiles. Mr. Ricardo gives results from tests of an engine using stratified charge and fuel throttling for reduced loads. The results show a remarkably constant thermal efficiency of from 30 to 35 per cent from full load to about 0.15 load.

The chemical energy of the explosive mixture supplied the cylinder is transformed into gas pressure by (*a*) an increase in temperature of the gases within the cylinder resulting from heat added during combustion and (*b*) a difference in specific volume of the gases before and after combustion, due to a change in the number of molecules during combustion.

The voltage necessary to produce an ignition spark varies from about 2000 to 15,000 volts, increasing with increase in density of the charge and length of spark gap at constant temperatures of the electrodes. Recently it has been found that an increase in the temperature of the spark plug electrodes decreases materially the sparking voltage required. This decrease may amount to as much as 50 per cent. It has been shown that when a truly explosive charge surrounds the spark gap any spark passing the gap will ignite the charge. It has not been shown, however, that this is true if the explosive charge be near the limit of inflammability, from either incomplete vaporization or dilution. The results of the experiments on the explosive limits of mixtures indicate that the character of the spark discharge has a decided effect on ignition. The effect of spark characteristics on the ignition of poor mixtures needs further attention.

Mention should be made of "spontaneous" or "auto-ignition" temperatures. Spontaneous ignition temperature is usually thought of as the temperature at which a given mixture ignites without ignition being supplied at any point from an outside source. Spontaneous ignition may occur in an engine cylinder with certain fuels and compression ratios. When an engine is operating certain metal parts, such as spark splug electrodes and valves, or carbon deposits, remain at a higher temperature than the average temperature of the charge. If the temperature of any of these surfaces is sufficiently above the ignition point of the fuel so that it can supply enough heat to raise a portion of the charge to the spontaneous ignition temperature, ignition will take place even though the average temperature of the gas is below its spontaneous ignition temperature. The lower the ignition temperature of the gas, the smaller the rise in temperature necessary to be produced in this way. Hence, ignition of this sort will occur in the engine at average mixture temperatures lower than the spontaneous ignition temperatures of the fuel, but these average mixture temperatures will vary under the same cylinder conditions with different fuels in much the same manner as the true spontaneous ignition temperatures of the fuels. It has been shown that the spontaneous ignition temperature for hydrogen at least is materially raised by the dilution of the explosive mixture by an inert gas.

Assuming the usual pressure volume and temperature relations, the increase in the average gas temperature, and therefore the cylinder pressure, is limited by four factors, (*a*) the amount of heat liberated by the combustion of the fuel per unit volume of combustible mixture, allowing for heat absorbed in the dissociation of the products of the combustion, (*b*) the heat capacity of the gases contained in the cylinder at the end of the preceding exhaust stroke, (*c*) the rate of heat loss from the hot gases, and (*d*) the rate at which the mixture burns.

Heat of Combustion

The heats of combustion of nearly all of the constituents of gasoline have been measured. (Some values for these heats of combustion were given in the article by Ricardo printed in AUTOMOTIVE INDUSTRIES for April 14, 1921.)

The rate of heat loss from the gases during combustion to the cylinder walls is not known. It is probably very high but of short duration. Measurements of the amount of heat entering the jacket water are of little value for this purpose. There is very little reliable information on the rate at which energy is liberated from a combustible mixture. This rate is not necessarily that with which the flame passes through a mixture.

The number of factors believed to affect the rate of burning is large, probably because we know so little about it and cannot as yet separate the important from the unimportant factors. Some of these will be enumerated but not discussed because of lack of information. They are (*a*) temperature and pressure at ignition, (*b*) point of stroke at which ignition occurs, (*c*) number of points of ignition, (*d*) mixture ratio, (*e*) shape of combustion chamber, (*f*) fuel, (*g*) turbulence, (*h*) auto-ignition temperature of fuel and (*i*) detonation tendency.

The cylinder pressures after combustion will be increased by an amount proportional to the increase in specific volume of the gears. This increase in pressure due to the presence of a greater number of molecules increases with the molecular weight of the fuel.

Gas Pressure Transformation Loss

The transformation of gas pressures into crankshaft torque in a cylinder, reciprocating piston and crank mechanism is fundamentally an intermittent process. It is made continuous either by the use of a reservoir of energy such as a flywheel or by the multiplication of elements acting intermittently, that is, the addition of working cylinders. There are four sources of loss in this mechanism: (*a*) incomplete expansion, (*b*) heat transfer from the gases under pressure, (*c*) work of filling and exhausting the cylinder and (*d*) mechanical friction of the moving parts. The loss from incomplete expansion is

usually given in terms of air as a working fluid and is one minus the so-called air cycle efficiency. The usual computation of the air cycle efficiency involves the assumptions that (*a*) the last three sources of loss mentioned earlier in this paragraph are zero, (*b*) the combustion is instantaneous, (*c*) the specific heat at constant volume is independent of both temperature and pressure, (*d*) the specific volume of the working fluid after combustion is the same as it is before combustion, (*e*) the ratio of specific heats of the unburned charge is the same as that for the burned charge and both are independent of temperature and pressure and (*f*) there is no dissociation of the products of combustion. Any loss incurred through incomplete expansion is directly due to the imperfection of the mechanism, because it is impracticable to increase the expansion without an excessive increase in the weight and size of the engine. This loss, however, should not be altered by the losses or gains resulting from the last five assumptions just made, nor should it be altered by assuming constants for a working fluid other than that which it is actually possible to use. Losses or gains due to these assumptions should be charged to the fuel and working fluid used. To be sure, our present knowledge of the effect of these assumptions is incomplete, but it is sufficient to tell us that none of them is negligible. The relationships involved in each can and should be determined in order that the status of any process of combustion under pressure can be truly interpreted. Some recent preliminary determinations of the ratio of specific heats at atmospheric temperature and pressure of a particular sample of explosive mixture taken from an engine, gave a value of 1.36 and a particular sample of exhaust gas gave 1.34. Corrections for the higher temperatures of the exhaust gases would probably reduce the latter figure below 1.30.

The loss due to the heat transferred from the working fluid to the cylinder walls is directly chargeable to the type of mechanism used. No good values of this loss have been determined but they may range from 15 to 25 per cent of the total heat in the fuel. The work lost in filling and exhausting the cylinder includes (*a*) a direst loss, negative piston pressures as given by the lower loop of the indicator card, and (*b*) an indirect loss, the loss in the weight of the cylinder charge due to throttling, gas heating, etc., usually included under the term volumetric efficiency, which is one of the factors governing the size of the engine used to give a definite performance, or the maximum power output of a given engine. Any reduction in the maximum power with a constant mechanical loss involves a loss in brake efficiency, and if a larger engine is required to produce the same power, both the mechanical losses and the power required to carry the engine are increased as the size of the engine is increased. The losses due to negative piston pressures increase with reduction in load. Losses due to a reduction of the cylinder charge vary with valve timing, valve design and engine speed. They may vary from 50 to less than 5 per cent. The losses due to mechanical friction of the moving parts vary from 10 to 40 per cent with different engines and increase so materially with speed as to raise some doubt as to the possible fuel economy of small high speed engines.

Power Transmission Efficiency

The transformation of crankshaft torque into thrust at the rear wheels involves three factors; (*a*) transmission efficiency, (*b*) universal-joint efficiency, and (*c*) rear-end efficiency. All of these factors are affected to a marked degree by the kind of lubricant used and its method of application.

Considering the system as a unit the efficiencies may vary from 50 to 85 per cent according to Riedler. The value given by the Automobile Engineer's Handbook, 1920, London, is 85 per cent. Lewis P. Kalb considers 90 per cent to be a closer value. Universal joint efficiencies, according to C. W. Spicer, range from about 92 to nearly 100 per cent when transmitting power in excess of 5 hp. At lower powers the efficiency may drop as low as 80 per cent. These data include results with angles of from 2 to 12 deg. with forks in the same plane and at 90 deg. Mr. Spicer makes the following statement:

> Between 10 and 100 per cent of full load, the efficiency is above 99 per cent for all angles less than 7 deg.

The efficiency of the gearbox according to tests made by Worby Beaumont is from 70 to 90 per cent on direct drive. C. M. Allen finds that the efficiency of a worm gear axle varies from 70 to 85 per cent with power inputs of from 2 to 8 hp. reaching 90 per cent for higher inputs. With a bevel gear axle the efficiencies ranged from 95 to 98 per cent with inputs of from 2 to 8 hp. and were above 98 per cent for higher inputs.

From the point of view of the power requirements of cars it is believed that (*a*) the car performance demanded by the average driver is not unreasonable and (*b*) greater fuel economy could be attained by a sound far-sighted good roads program through possible reduction of car weight and also road resistance.

From the point of view of power development and its delivery to the road it is believed that (*a*) the greatest gain in fuel economy would result from an effort spent on the preparation of the unburned charge under all conditions of temperature, engine speed and load, first from a thorough mixing of the air and fuel and second from a correct variation of the fuel and air proportions; (*b*) the reduction of the mechanical friction losses, possibly through a change of engine speed and size, will increase the fuel economy at part throttle without any sacrifice in performance and (*c*) the closer study of the processes of combustion will make possible a rational basis for the statement of the ultimate engine efficiency and a clearer conception of the value of different fuels.

Some of the most valuable information presented in this paper was contained in six appendices written by other members of the Bureau of Standards staff. These will be published in condensed form in a later issue.

The New Federal Is Heavier

(*Continued from page* 1196)

with a ratio of 10¼ to 1 as standard. The standard tire equipment comprises 36 by 6 front, and 40 by 6 dual rear, solid tires. Forty by 12-in. giant pneumatics can be provided at extra price. The wheels are steel, with hollow cast spokes, but webbed internally for strength. Among the items of standard equipment are towing or pintle hooks at the front of the frame; a hub-odometer and Alemite greasing attachments on all bearings.

A LONDON-AMSTERDAM aerial service was started on April 14 by the Koninklijke Luchtvaart Maatschappij with a Fokker Type F-111 monoplane. The machine is fitted with 230-hp. Siddeley-Puma engines and has a cabin seating five passengers, of which three face forward and two aft. The driver's seat is at the side of the engine, much like in the latest type of London motor bus. The first regular trip started from London at 10:15 a. m. and ended at Amsterdam at 2 p. m. the same day. A quarter of an hour after the arrival of the first machine in Amsterdam the second machine left the latter city for Croydon, where it arrived at 6 p. m.

How to Lighten Front Axle Sections Without Decreasing Strength

Narrower outside draft angle is entirely practicable and permits better disposition of metal. In one case slight changes in section made possible a saving of over 6 lbs. per axle without material decrease in strength.

By Herbert S. Jandus

IN the past, the design of front axle sections was arrived at by the rule of "present practice." The usual procedure was to collect all possible data on current designs which had been in service for a period of time, make such changes as the record indicated, check up the section modulus and let it go at that.

Of course experience is fundamentally the biggest factor in successful design, but for economical reasons it is advisable to combine that experience with a reasonable amount of theoretical practice and check the results obtained so as to determine whether the section is the most suitable and economical one that could be devised.

Obviously the most economical section is that having the bulk of its area disposed at the greatest practicable distance from the neutral axis of the section. Structural rolled I-beam shapes represent, perhaps, the most economical sections in use to-day. The outside of their flanges being flat and without draft, and only a slight draft being necessary on the inside of the flanges, the resulting section is one in which the metal is advantageously placed for minimum area and maximum strength.

While it is possible and practicable to roll sections with thin webs and flat flanges, it is not practicable to forge them thus. On forgings draft is necessary both on the outside and the inside of the flanges, and the thickness of metal cannot be reduced beyond the point at which the metal will readily flow to the required depth in the die. It is, however, both possible and practicable to improve considerably on the present average design and for a given strength increase the "efficiency" as defined below from 5 to 10 per cent.

The usual draft angle for forged axle sections is 10 deg., this angle being advocated by the forge shops as best adapted to quantity production, as it obviates sticking in the dies due to the contraction of the forging in the die-block. Since the contraction of the forging in cooling is responsible for this difficulty, it is apparent that the inside faces of the flanges are the surfaces that tend to grip the die-block, while the outside faces tend to draw away from the die.

It seems, therefore, that a reduction of the draft angle on the outside of the flange would not only be practicable from the forging standpoint but would result in a more advantageous disposition of the metal of the section. Upon taking this matter up with the forge shops it was found that 7 deg. was a perfectly practicable draft angle for the outside of the flange and even 5 deg. could be used without difficulty.

Figs. 1, 2, and 3 show axle sections having outside draft angles of 10, 7 and 5 deg. respectively, while Fig. 4 represents an ideal condition with no outside draft. Taking Fig. 4 as an arbitrary standard for comparison and calling it 100 per cent, the "efficiencies" of Figs. 1, 2 and 3 are 93.4 per cent, 95.3 per cent and 96.8 per cent respectively, these "efficiency" values being based on the ratio of the radius of gyration to one-half the total depth of the section. The inside draft angle of the above sections is 10 deg. in all cases.

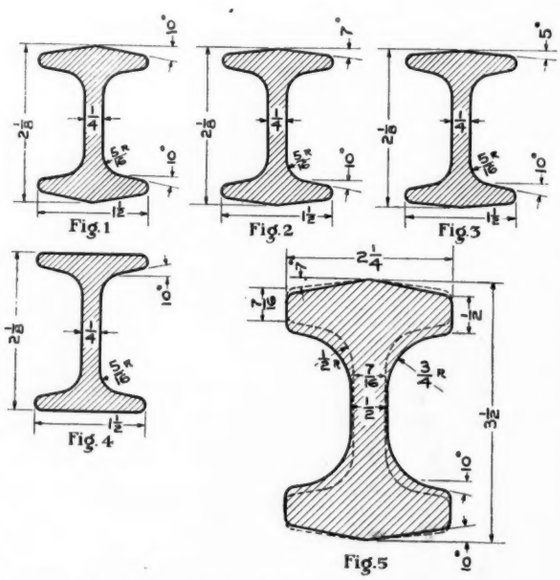
Since the strength of any section varies directly as the cube of its depth while the area varies directly as the first power of the depth, it is evident that the ratio of the moment of inertia to the area would not represent a constant ratio for different sizes and shapes of sections. In order to allow for this variation and express a true relation of strength to area which is independent of the size or shape of section under consideration, it is necessary to use a first power function of the moment of inertia. The radius of gyration fulfills this requirement as follows:

$$r \text{ (radius of gyration)} = \sqrt{\frac{I}{A}}$$

in which

I = moment of inertia,
A = area of section.

Now I is a function of the fourth degree while A is a function of the second degree. The radius of gyration, therefore, is a first power function and represents a distance from the neutral axis at which the total area of the section may be considered as concentrated. It follows that for sections of the same area regardless of shape, that one having the greatest radius of gyration has the greatest "efficiency," or to put the expression in another form, the more closely the radius of gyration approximates the distance of the outermost fiber from the neutral axis, the



Figs. 1, 2, 3 and 4—Axle sections with various angles of draft. Fig. 5—Changing the axle section shown in heavy lines to conform to dotted lines decreased axle weight 6¾ lb. without material decrease in strength

more "efficient" the section.

The ratio of the radius of gyration to one-half the depth of the section may be designated the "efficiency factor," and represented by the symbol e, thus:

$$e = \frac{r}{d}$$

The values of e for the different sections shown are as follows:

Fig. 1—10 degrees draft—$e = .700$
Fig. 2— 7 degrees draft—$e = .715$
Fig. 3— 5 degrees draft—$e = .726$
Fig. 4— 0 degrees draft—$e = .750$

In order to show a practical application of the above principles as applied to an actual axle section, attention is directed to Fig. 5. This section is one in actual use to-day and has a 10 deg. outside and inside flange draft. The properties of this section are as follows:

$I = 5.830$
$A = 4.350$ sq.in.
$r = 1.157$
$e = .661$

The "efficiency factor" value of .661 corresponds to an "efficiency" of 88.7 per cent based on the arbitrary standard section above referred to.

The dotted outlines in Fig. 5 indicate a substitute trial section having a 7 deg. outside draft and a flange and web thickness of 7/16 in. instead of ½ in. as in the original. The properties of this revised section are as follows:

$I = 5.760$
$A = 3.776$
$r = 1.234$
$e = .706$

This value of e corresponds to a relative "efficiency" of 94.75 per cent and represents a gain of 6 per cent. It should be noted that the above revised dimensions were held within the limits prescribed by the original section and this necessarily limits the possible increase in efficiency. An increase in the width of the flanges would, of course, place more metal away from the neutral axis with a corresponding gain in "efficiency."

In the particular case above cited, the axle bed is approximately 43 in. long from outside to outside of the spring pads. The saving in area is .574 sq. in. or, for the total length above named, 24.1 cu. in. At 0.28 lb. per cu. in. of steel, this corresponds to a saving in weight per axle bed of 6¾ lb., an item of no small importance when large production costs are considered.

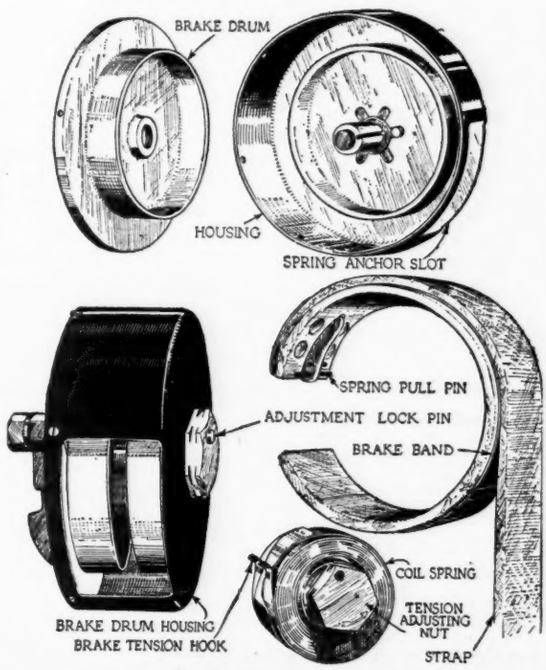
By the observance of the above principles and a little care in the design and proportions of an axle section it is possible to produce practical sections having a relative "efficiency" as high as 97.0 per cent.

A New Type of Shock Absorber

A NEW type of shock absorber in which the resistance to spring action at the normal position of the spring is very slight and which increases as the spring deflection increases, has been put out by the Watson Company. The new shock absorber known as the stabilator depends on friction for its operation, the friction being secured between a brake band and shoe, which is so mounted and designed as to afford varying degrees of friction, depending on the location of the spring.

The illustration herewith shows the parts of the shock absorber. The brake drum and housing are stationary. Surrounding the drum is a brake band, around part of the circumference of which is a pull strap which is connected with the axle members. The tension on the brake band is regulated by a coil spring which is held at its inner end by a slot in the hub of the shock absorber. At the outer end there is a hook which engages with the end of the brake shoe. As the spring takes up its normal position under the ordinary load of the car, the brake band is unwrapped from the shoe to such a position that very little friction occurs, because of the fact that there is only slight engagement between the brake band and shoe. This unwrapping is done against the tension of the spring. When an obstruction in the road is struck, causing the axle to lift off the ground, the spring tension causes the brake band to warp around the drum just as rapidly as the pull on the strap is released, due to the flexure of the spring. The friction between the band and drum prevents the rapid rebound which would ordinarily occur, due to the potential energy in the leaf spring. As a result, the spring is allowed to return slowly to normal position, the resistance to its action tapering off gradually, as the amount of contact between the brake band and drum decreases.

Due to the length of the coil spring, no flexure of the leaf spring is so rapid that the movement of the brake band cannot keep pace with it. The result is that the shock absorber is ready to function on the instant that the spring tends to return to normal. Due to the wrapping action of the brake band around the drum, which increases with the amount of spring flexure, the action of the shock absorber is practically proportional to the action of the leaf spring. The tension of the spring is adjustable by turning a nut on the outside of the housing, thus winding the spring more tightly, or releasing it to some extent. All of the parts are given a Parker rustproof finish and the brake band material is a special quality designed to endure the life of the car.



Parts of the Watson "stabilator"

Fifty million citizens are made happier, healthier and better by the automobile.

Can you imagine a city without automobiles? Think about it.

Material Flows Steadily With Efficient Intra-Plant Trucking

An analysis of trucking methods in any plant may reveal opportunity for reducing costs and eliminating interruptions from the flow of material. In the big factory discussed here, practically no hand trucking is necessary. Planning and supervision achieve the results described.

By Norman G. Shidle

TO operate a plant comprising nearly a million and a half square feet of active working space, and to move all the material required for this task without the use of a hand truck is a notable achievement in the design and operation of production equipment and methods. Theoretically this has been accomplished at the Studebaker light six factory; practically it has been so nearly accomplished as to render the achievement no less noteworthy.

The elimination of hand trucking means not only reduced labor costs, but also the reduction of confusion to a minimum, the lessening of delays and interruptions, and a continuously high standard of efficiency in the handling of material. Two factors are responsible for the accomplishment of this end.

1. The layout of buildings and equipment, together with the installation of conveyors and other mechanical labor-saving equipment in every possible instance.
2. The effective routing and handling of power-trucking equipment.

The degree to which the first factor is developed will determine to a large extent the difficulty of handling the second. But even under the best conditions, a great deal of careful planning and intelligent administration is necessary to get the best results from a minimum of trucking equipment.

The completeness of the conveyor and labor saving equipment and the efficient way in which it has been placed and utilized at this plant cannot be adequately treated in a brief article. In making all the parts for and assembling a large number of cars each day, however, it is obvious that there must be a movement of material between buildings and sections that cannot be handled in any way except by trucking. And it is apparent that the continuous flow of material through the various departments is dependent fundamentally upon the efficiency of the trucking system. In fact, the very completeness of the conveyor equipment within the various departments renders more necessary than ever an efficient trucking system, since a break in the flow of material means that much expensive equipment is idle.

Moreover, the problem cannot be solved simply by a multiplicity of trucks of various kinds. The larger the number of trucks and operators or laborers, the greater the need for supervision and direction, the greater the chance for confusion and inaccuracies and the greater the investment in trucking labor and equipment. In other words, the only solution to the problem lies in applying to the matter of intra-plant transportation the same methods of careful analysis, intelligent routing, and close supervision that are exercised in connection with other phases of the production system.

There are more opportunities for waste in an inefficient trucking system than are generally realized. Some of these have been pointed out. A description of the trucking methods used at this Studebaker plant serve to show how trucking costs can be reduced through intel-

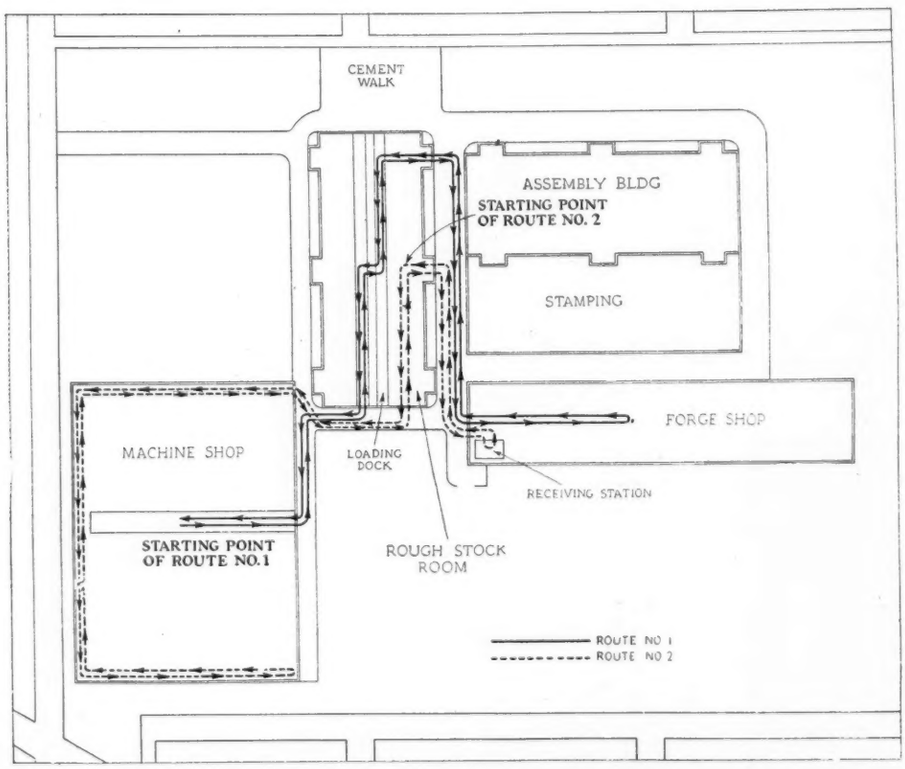


Fig. 1. Ground plan of Studebaker light six plant, showing relative position of various buildings, together with truck routes

ligent planning and routing, and how important is this phase of production activity.

All of the parts of this car are manufactured within the limits of the plant, with the exception of the foundry work, which is located at some distance away. The accompanying plan, Fig. 1, shows clearly the various units of manufacture and their relative location. On the basis of this plan it is possible to discuss definitely the various aspects of the trucking system. Samples of these special trucks are shown in Figs. 2 and 3. Fig. 2 shows the type of truck used for carrying transmissions and the type used for cylinders, while the crankshaft truck is shown in Fig. 3.

As stated previously, there is practically no hand trucking done in the plant. The equipment for moving material from one department to another consists of several Mercury electric industrial trucks and a large number of small box trucks and special built trucks or racks for specific parts. The box and special trucks are hauled in trains by the Mercurys, each Mercury having a special route and a definite task to perform.

Run Number 1 and Run Number 2 operate on a schedule as do railroad trains, making certain definite stops at definite times, and for a definite purpose. Run Number 1 begins at the machine shop inspection bay, as indicated on the drawing. It should be explained in passing that the finished production of the machine shop feeds directly into this inspection bay from both sides. Here the finished machined parts are inspected and loaded on the box and special trucks. The trucks are then made up in trains.

The Mercury comes to the inspection bay, hitches on to this train of finished parts and carries it out of the inspection bay along the route traced on the map to the shipping and receiving dock which bisects the sub-assembly building. Various platforms protruding from the different floors are adjacent to the various sub-assembly stock rooms, in which are stored the finished parts for subassemblies.

At this receiving dock the Mercury drops from its train the trucks filled with finished parts ready for the subassemblies. The big traveling crane then picks up the trucks and distributes them to the proper platforms.

From here the Mercury train goes on to the assembly building where it drops more trucks. The trucks contain certain parts which go directly from the machine shop to the final assembly line. From this point the train goes on to the forge shop where it makes its last stop. Here it drops the finished parts which are to be heat treated.

Having left the last of its full trucks, the Mercury picks up the empty forge shop trucks, and starts on the return trip, picking up empties at the various stopping points of the backward journey. The entire round-trip for this run comprises a distance of about .7 of a mile. The Mercury train runs on a thirty-minute schedule, leaving the machine shop inspection bay every thirty minutes throughout the day. A view of Run Number 1 Mercury train leaving the machine shop inspection bay is shown in Fig. 4.

The driver punches a time clock at the beginning of each trip, the first trip being at 7:15 a.m., according to the usual schedule. An examination of a number of time cards picked at random from this run indicate that it has proved possible to adhere to the schedule with surprising regularity. Everyone with any actual experience in attempting to regulate similar trucks, realizes the many petty delays and difficulties which tend to throw the schedule out.

A careful planning of the route, however, together with thorough instructions to the drivers concerning their duties and routine, has made it possible here to eliminate a large proportion of these inefficiencies. The trains are made up for the driver at each station, so that he has to leave the truck only to attach the train to the Mercury. As

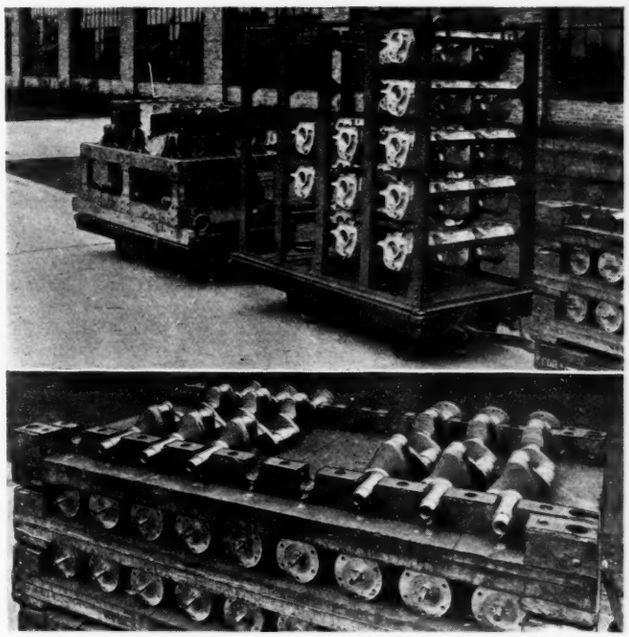


Fig. 2 (Above)—Type of special trucks used for carrying transmissions and cylinders
Fig. 3 (Below)—Type of special truck used for carrying crankshafts

an indication of how well it has been possible to work out this system, the following times are given from a time card of the driver on this run. The card was chosen at random, only the times for the afternoon runs are given, but will be sufficient to illustrate the point:

P. M.: 0.18, 0.90, 1.40, 1.72, 2.20, 2.67, 3.17, 3.65, 4.13, 4.65.

Run Number 2 is the longest, requiring 50 minutes to complete a round trip. Not only is this run of considerable length, but it includes a number of stopping points.

The run begins in the rough stock room, where the Mercury starts out with a train of trucks loaded with rough stock destined for the forge shop. It carries this train to the forge shop, drops it, and brings back finished forgings to the rough stock room. It then takes a train of rough stock parts to the machine shop, by the route indicated on the drawing.

As it enters the machine shop at the end nearest the subassembly building, the Mercury drops off its train at an inspection desk, where all of the parts are counted. While this load of rough parts is being counted and inspected, the Mercury picks up the train which it brought on the previous trip and which has subsequently been counted. This it takes around the outside aisle of the machine shop, dropping off at each of the various departments, the rough parts which are to be machined there.

The machine shop is so arranged that with one or two exceptions, the first operation on every part is done on a machine adjacent to this outside aisle. Thus no hand trucking is necessary to bring the stock to the machine. The Mercury simply drops the truck load and the stock is practically in position for the operator to take the pieces and place them in the machine for the first operation.

When the Mercury has thus disposed of all of its train, it turns in its tracks, and picks up empties on the way back. It carries this load of empties back to the rough stock department and is ready to begin another round trip.

It will be noted, as indicated previously, that the machining operations are so arranged that the last operation on each piece feeds into the machine shop inspection bay, out of which the finished parts are carried by the Mercury on Run Number 1 as described. Thus with the first operation placed so as to receive the parts directly from the Mer-

Fig. 4. Truck train leaving machine shop receiving bay on Run Number 1

cury on Run Number 2, no hand trucking or manual labor of that kind is necessary.

The driver on this Number 2 run also punches a time clock, 50 minutes being the time required for a round trip, as stated before. In this case, however, he punches a clock at several points on his journey. Fig. 5 shows the card used for this purpose, the points at which he checks himself, and the times of the trips for one morning.

Run Number 3 is not operated on a definite time schedule, but the driver has a set program which must be followed out. The program is such that it is impossible for him to have any idle time, though the run is such that a time schedule is not feasible.

This driver operates on the second, third, and fourth floors of the sub-assembly building and on the second floor of the final assembly building. The various sub-assemblies, including front and rear axle, transmission, wiring and small parts, motor, etc., are concentrated in the one building, which is connected by a bridge to the final assembly building.

As these various sub-assemblies are completed, they are placed upon specially constructed trucks. The Mercury on Run Number 3 then comes along and carries those truck loads to the final assembly stock room on the second floor of the final assembly building.

While the actual ground covered by this driver is not so great, his speed is diminished by the necessity for going up and down on the elevator. Upon him depends the supply of finished parts for the final assembly line, and he is kept continually making his regular round.

Run Number 4 covers the stamping building. The man on this route takes the finished stampings to the stamping inspection department, located in the same building, and plies between the stamping building and the final assembly building. His route consists of a large number of very short runs, so that a time schedule again is not feasible. It should be noted, however, that in this, as in every other case, the driver has a definite restricted territory and specific duties to be performed.

Even in the "best regulated families" every action or operation cannot always be fitted into a groove. So with this efficient trucking system. To care for the different trucking needs not covered by the specific routes, the Mercury on Run Number 4 performs miscellaneous service. This does not mean, however, that it runs aimlessly about the plant at the beck and call of everyone. It works only on written orders from the trucking foreman.

The Run Number 4 driver gives two hours each day to the oil stores department, two hours to the receiving dock, and about five hours to miscellaneous dies and haul needs.

The other regular run consists of carrying scrap to the salvage department from the various departments of the plant. One extra Mercury is held in reserve, to take the place of any other Mercury which may have to be laid up temporarily for repairs.

On Run Number 1 and Run Number 2 very long trains are usually carried, averaging between 20 to 35 trucks. The length of the trains is limited rather by the possibilities of speed, and safe and efficient handling than by the ability of the Mercurys to pull the loads. On Run Number 3, for instance, long trains of this kind cannot be pulled because of the necessity of using the elevators.

By these systematic methods of truck operation the material is handled almost twice as rapidly and efficiently as before the methods were installed. The transportation foreman has a definite check on every train, knows approximately where it should be at any given time, and is able to check up very closely on any loitering or inefficiency on the part of the drivers.

At one time helpers were sent along with the driver of each Mercury, but experience has shown that far better results are obtained through the present method. The truck trains are made ready for the Mercurys, so that the driver does not need a helper. It is found that there is less loitering, horse-play, etc., under this system, while less time is actually spent in preparing the trains and getting them under way.

Before the present system was installed, there was considerable delay in the distribution of material, although three more men were engaged in the work of taking it about. Material is reaching its destination on time, and the flow of work through the plant is thereby accelerated materially.

Even under a system of close supervision, however, a good deal depends upon the men who are actually driving the Mercurys, according to the transportation foreman. Where the driver is intelligent as well as interested in his job, he can facilitate the movement of material to a great extent; he can readily meet the small difficulties which must constantly arise in any such job; and he can act effectively without having to delay proceedings for minor instructions. Although the pay for the Mercury drivers is not high, the job offers certain opportunities which appeal to some wide-awake young fellows. It takes them around to the different departments of the plant and allows them

MERCURY
Daily Schedule of Mercury No. 2

	Leave Machine Shop	Arr. Forge Shop	Leave Forge Shop	Arr. 703-A	Leave 703A	Arr. Final Bay
1	7-15 A.M.	7:20 A.M.	7:30 A.M.	7:35 A.M.	7:45 A.M.	8:10 A.M. etc.
2	8:15	8:20	8:30	8:35	8:45	9:10
3	9:15	9:20	9:30	9:35	9:45	10:10
4	10:15	10:20	10:30	10:35	10:45	11:10
5	11:15	11:20	11:30	11:35	11:45	

THIS TO BE FILLED OUT IN FULL BY DRIVER & HANDED TO DISPATCHER

Fig. 5. Sample card and time schedule used for Run Number 2

to learn a great deal about the general manufacturing processes, if they have a desire to learn. It enables them to see and understand a large number of jobs, and perhaps to choose some better job or trade into which they would like to go at a later time.

The results achieved by a close analysis of the intra-plant trucking problem at Studebaker indicates that money can be saved and production speeded up at the same time through a careful study and operation of this phase of material distribution. It is a factor of the production problem that has not been studied as closely as some others and in many plants offers opportunities for improvement.

Economical Forming of Storage Batteries

Installation of boosters at the Prest-O-Lite plant permits batteries which are undergoing forming operations to be discharged back into the line thus saving much energy and reducing cost of manufacture.

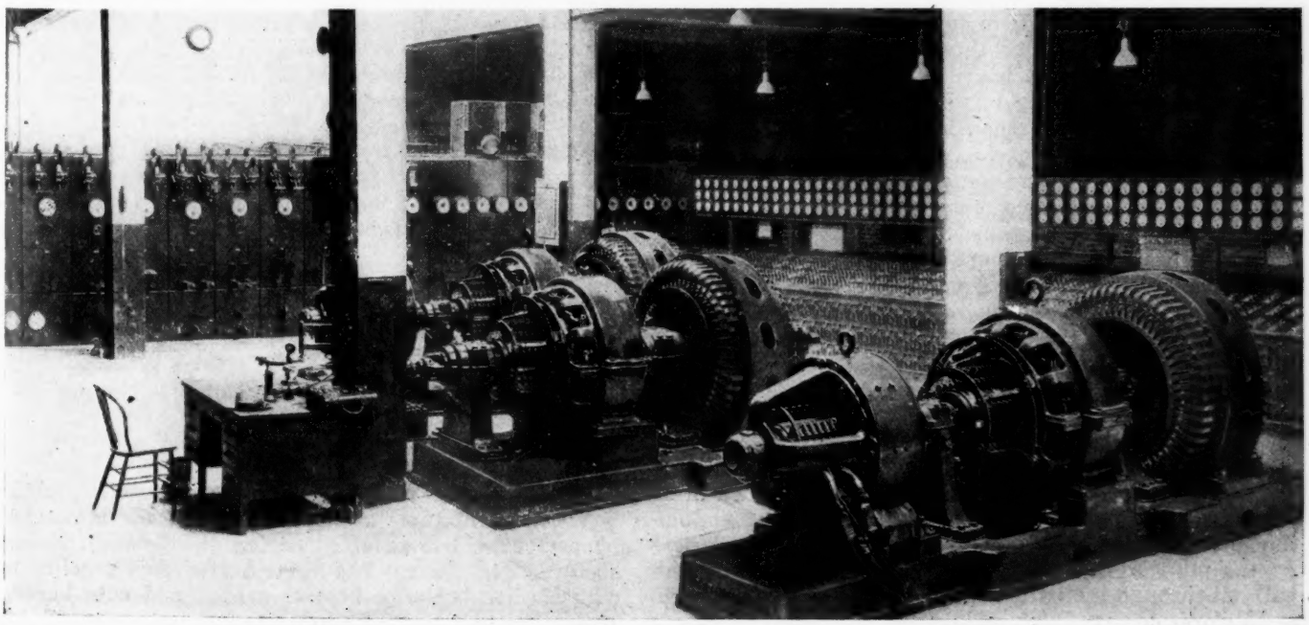
STORAGE batteries, before they are ready to leave the factory, are subjected to a number of long charges and discharges in order to properly form the plates, after which they are given a final charge. This requires a considerable amount of energy and usually forms an important item in the cost of manufacture of the batteries.

At the Indianapolis plant of the Prest-O-Lite Co. this energy is furnished through synchronous motor generator sets converting the energy from 4100-volt 3-phase alternating current to 250-volt direct current. In the photograph are shown two 625-hp. and 450-hp. machines. An 875-hp. machine will be installed shortly. The feature of this equipment is the use of three units for each machine, the third unit being used as a booster to allow the storage batteries to be discharged directly back into line.

The method of accomplishing this is shown in the accompanying diagram of connections, and can be understood by an explanation of operating conditions. For charging, batteries are connected across the 250-volt generator in the regular manner, the generator (Fig. 1) delivering 800 amp. for charging various batteries, each having a suitable charging rheostat connected in series therewith. If several other batteries are connected to the discharge circuit, the conditions shown in Fig. 2 exist. These batteries are connected in series with a booster which composes the third unit of the converting apparatus, it being a 100-volt direct-current machine. Assuming that the batteries on discharge deliver 200 ampères through rheostat to the negative terminal of the booster and the voltage is thereby raised 100 volts, the batteries on discharge will develop approximately 150 volts, which with the 100 volts developed by the booster, causes the discharge circuit to pump 200 amp. into the 250-volt bus. Therefore, with a current of 800 amp. flowing through the batteries on charge, only 600 amp. is delivered by the main generator because the discharge current is delivering 200 amp. to the charging circuit.

The main object of this booster is to increase the capacity of the charging equipment. That is—with a standard motor-generator set, the number of batteries which could be charged at one time would be limited to the capacity of the motor-generator set. With the addition of the boosting generator on the same shaft the effect is obtained of increased generator capacity. For instance, in Fig. 1 the 250-volt generator is delivering 800 amp. for charging or is producing 200 kw. Now, if a 200-amp. 150-volt battery is placed on discharge, 30 kw. are available. In this case, the generator will be required to deliver only 600 amp. or 150 kw. However, to raise the voltage of the discharging circuit to 250, 200 amp. at 100 volts must be produced at the booster machine. This amounts to 20 kw. Therefore the same number of batteries are charged with only 170 kw. being taken from the main source of supply neglecting the losses in the machines.

In this plant, the facilities for charging the batteries are comprehensive in principle but simple in operation. Each battery circuit is controlled through bench board panels equipped with knife switches, rheostat handles



Storage battery forming installation at the Indianapolis plant of the Prest-O-Lite Co.

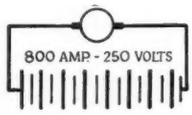


FIG. 1

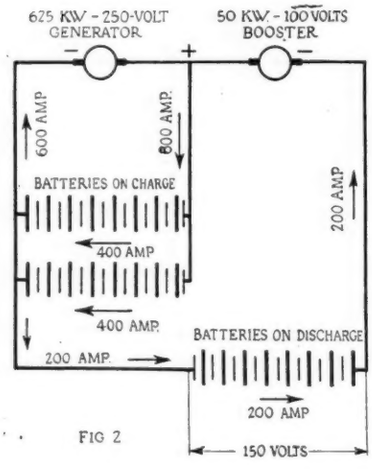


FIG 2

Figs. 1 and 2—Diagram of connections of battery forming plant

and ammeters. On one side of the room there are 288 of these circuits and on the other side there are 180 circuits. Two operators can easily handle all of these circuits and thereby charge and discharge a great number of batteries at the same time. One of the interesting features of this charging equipment is the method of mounting the grid rheostats. On the side shown in the photographs, these rheostats are mounted nine in a row directly behind and on a level with the board. On the other side, however, there was not enough space for this kind of mounting so that some of the resistance had to be mounted above the top panel. This type of mounting precludes accessibility but as in two years of operation there has been no need of repairs on the 288 circuits, such facilities are thought unnecessary.

At the end of the room is the switchboard controlling the motor-generator sets. The 4100-volt energy enters through an oil switch and then goes to the main bus. The motors of the machines are connected directly to this bus through separate oil switches. No starting apparatus is necessary because the motors are designed to start as induction machines.

On this switchboard are also contained the panels controlling the power circuits for the rest of the plant.

A Hydraulic Type of Clutch

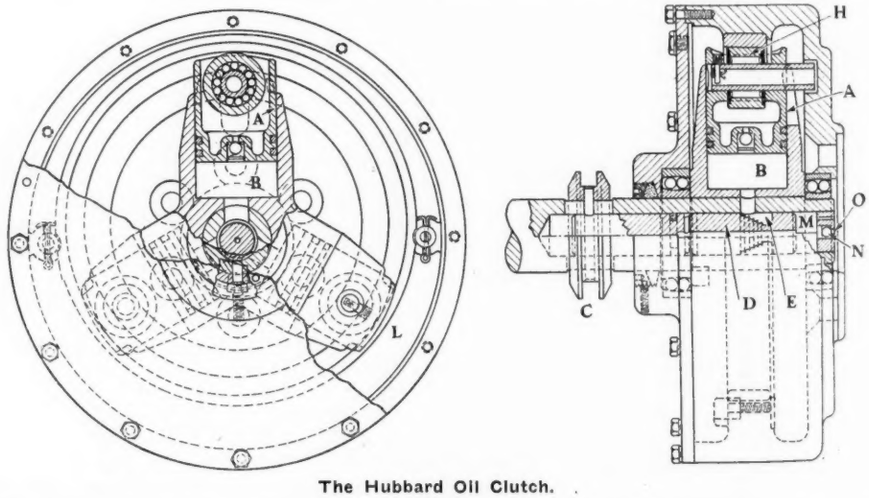
A CLUTCH which is claimed to afford the desirable feature of easy engagement and positive driving lock has been developed. The feature of this clutch is that it can be engaged with any degree of slippage so that the power of the engine can be developed as desired and yet smoothly and evenly transmitted to the rear wheels at extremely low vehicle speeds. When disengaged the clutch functions in reality as hydraulic transmission.

The clutch is built inside the flywheel in the usual way and is inclosed. It runs in a bath of oil. In the sectional illustration the pistons are shown at A. Oil is imprisoned above these pistons in the cylinders B and can be by-passed from one chamber to another above the pistons by moving plunger D to open the by-pass shown at E. The three pistons A ride on roller bearings H against the eccentric ring L, which is ½ in. off center, thus allowing the pistons to make a 1-in. stroke. When the clutch is released the continuous by-passing of oil from the three chambers B through E maintains a constant equalization of pressure above these pistons so that the roller bearings are in idling action against eccentric ring L, and the pistons are in constant pumping action.

When the clutch is engaged plunger D moves forward to close by-pass E, thus locking the pistons A against the eccentric ring L. This locking action results from closing the by-pass from oil-filled chamber B, the oil remaining under each piston. It is impossible to drop the clutch into sudden engagement, for at the end of the plunger D is a space M which acts as a dash-pot. As the plunger D is pulled back, this space M is filled with oil through the ball valve N. If the foot is released suddenly from the clutch pedal the oil within this dash-pot M flows out gradually through the by-pass O, this causing smooth gradual engagement of the clutch.

It is evident with the hardened steel roller bearings which are rotating about the contact ring during slippage of the clutch that there are no parts in the clutch which can be worn by slippage and consequently the driver is free to slip the clutch as much and as often as he pleases, thereby giving him additional traffic control without in any way damaging the clutch.

The pressure required to release the clutch is equal to the tension of a spring only strong enough to hold the weight of the clutch pedal. The clutch is the product of the Hubbard Clutch Co.



The Hubbard Oil Clutch.

BENZOL and alcohol are readily miscible. Alcohol-benzol mixtures will not freeze at low atmospheric temperatures, but unmixed commercial benzol freezes at about 23 deg. Fahr. The lightest grades of gasoline mix with alcohol, but with heavier grades, and with kerosene separation occurs. Separation is prevented by addition of a mutually miscible solvent such as benzol.

Human Study a Necessary Factor in Automotive Sales

Now that it is necessary to discover merchandising in the automotive field, the question is uppermost as to the proper place to look. Most searchers have turned to statistical tables. Here is a suggestion for another field.

By Harry Tipper*

I WAS in Detroit last week visiting with some of the people who are at the center of the automotive manufacturing, attempting to discover what the conditions were from the production standpoint. They are better than we could expect in view of conditions.

The manufacturers are moving forward in production further than we had any idea of at the beginning of the year, and those manufacturers who have maintained their product on a basis of stability and their organizations on a basis of fair efficiency are moving ahead a little faster than the average. The orders up to June show a very surprising volume. In the replacement business the cars and trucks that are in use are apparently beginning to absorb their usual quantity of replacement materials. Stocks in the case of jobbers are beginning to move once more and they expect to keep them to a normal basis during the rest of the season. So the outlook is better. We had a rather severe shock but the possibilities are that we shall have sufficient business to take care of on the basis of present industrial conditions.

We have to discover merchandising in the automotive field now. We have not had to do it heretofore. The entry of a new convenience of that kind into the world's possibilities required no particular merchandising. It required only more or less effective production in order to bring it into use. At no time have conveniences of communication or transportation required very much merchandising to sell them; they have been seized upon, always, with avidity by the world's population because progress depends entirely on communication and the ease of transportation itself. The automobile offered a flexible unit of transportation, under the control of the individual, and this opened up an entirely new field of social and industrial possibilities to the individual and the community. It was seized upon just as fast as we could turn it out—people desired to have it and we have not yet fulfilled the desires.

The future of the business depends on our intelligence in knowing the conditions and not on any supposed saturation point or limiting point in the possibilities of use. As a matter of fact, we are entirely too prone to view industry from a static standpoint, as though we could take a stationary and fixed view of it. We talk about economic conditions of the country as being against the possibility of consuming more or less of this or that material, but we forget that the economic conditions of the country depend upon our productivity, on the increase of our population, the growth of our wealth and a number of factors that are not stationary in themselves but are constantly moving. Any view we take of industry must agree with the dynamic character of the industry itself. It is always moving and the automobile business has not moved in the volume that it must approach.

It might be worth while to spend just a minute on that point because the thing has grown so fast that we are a little doubtful if there is not some magician's trick in it that will leave us in the lurch later on.

In the passenger car business, we have established so far that a car on the present basis of production and efficiency will last a little more than five years and on that basis we shall have replacement requirements, at the end of five years, of about 1,700,000 automobiles merely to keep the present number going. We have exported a few cars in a single year abroad, but we have a market there that we have not yet touched. We must supply cars to the great foreign countries of the world, because there is no competing country manufacturing on a mass production basis in automobiles. For medium low-priced cars and even high-priced cars there is no corresponding value in the largely hand-work or individual production of the other manufacturing countries. There is no possibility of getting the volume out of those countries.

We talk as though mass production could be gained in a few months by putting a little machinery in the plant, but it has taken the automobile business ten or fifteen years to standardize for mass production. They have not begun to standardize the work in European countries. They have ten or fifteen years of standardization work before them. Organization cannot be planned in a few months unless the elements have been established and these other countries have not established organization for mass production. The call came to us all last year in our office from people all over the world, importers, distributors, dealers in cars and trucks and tractors wanting to know about the American product, claiming it the only thing they could get in a reasonable time and in reasonable quantity. This offers a foreign market two or three times as large as at present and in itself is enough to make the outlook somewhat inspiring. The matter of the possibilities is not a discouraging one and the only discouragement we can get is from our lack of analysis of the situation. The reason for our lack of analysis is the fact that we have not been obliged to analyze heretofore. We have not had to know why automobiles were bought. We are ignorant of many of the merchandising necessities. We must now discover what these necessities are and I wanted to suggest a few things that enter into this.

First of all merchandising is a human matter. Our

*An address by the Business Manager of AUTOMOTIVE INDUSTRIES before the Advertising Club of the Brooklyn Chamber of Commerce.

market statistics are of no value unless they tell us a human story. After all, buying is done by human beings and because of human reactions. It is affected by tradition and association just as much as it is by economics. The desire to buy a single product may rest in the mind for years before the possibility of buying comes along, but when the money is there the spending of that money is influenced by the long controlled desire. We must understand the human reaction if we are to understand the market conditions.

What we are trying to do in merchandising is to produce a favorable reaction toward us on the part of every individual and have that result in agreement for the exchange of a product. We have been too much inclined to consider markets as based upon statistics and economics. As a matter of fact, the statistics and economics are the outcome of the previous condition of the market and all they can do is to give us a general idea of the flow and ebb of human actions in connection with industry and merchandising.

We have not studied human reaction very far in the automotive business. Along in last August when the drop began to come, I was asked by some of the manufacturers what would be the probable return and I made the statement then **that the social buying of passenger cars would begin before the industrial buying of trucks —long before any business buying—and I based it upon the fact that the social buying would come first from those people who had had a long desire to own a car and found it impossible for one reason or another to do so.** Among the individuals in the population there is always money to be spent, even when money is scarce in the general sense.

I know in my own travels of certain general classes who had been out of the buying of cars all through the war but who had never lost the desire for a car, who were beginning to get in shape for the buying of cars. That is what happened. The volume of production in passenger cars to-day is much larger than the production of the truck, simply because the human reaction is different and the desire to buy on the part of the individual is more insistent than the necessity for buying on the part of business.

That is something we have not paid much attention to in the marketing of automobiles. Similarly we have not paid much attention to why the thing is bought. The sales reasons which you give for a car or any other product are frequently not the reasons why people buy at all. You have insisted on the technique as well as the details of the car to a degree which might have been all right in the beginning but is no longer necessary. You have neglected the insistence upon a lot of other details which are absolutely necessary for a favorable reaction on the part of many buyers.

I watched in the shows last year and this year and heard the conversation between the people who wanted to buy and the people who were selling. A lot of information was displayed on the part of customers about the technical details, but the reaction after they left the booth, the conversation among themselves, did not go much on the technical details. It went upon the conveniences of the car, of the shift lever, on the room in the front seats and the character of the upholstery, upon the feel of the tonneau seats and of the probability of its riding easily and matters of that kind connected with the immediate comfort of the passengers, but I did not notice the insistence on those points in the booths.

We do not study quite sufficiently people who buy. It is a curious thing. I was talking to Mr. Clark at lunch and he found it rather extraordinary, that in an investigation made not long ago not one of the owners approached knew what tires he had on the car previous to the last two that he bought, and a great many of them did not know what tires they had on the car at all. That seemed extraordinary and he felt there must be some mistake, but it was a very careful investigation. There are many reasons for that, but one of the important reasons is that the buyer does not buy tires for the reason that the manufacturer thinks he does. Many tires are bought because they are recommended by a neighbor or the dealer and many tires are bought because they justify themselves among the neighbors or to the dealers. Many buyers refuse to purchase tires because they think a great deal of luck enters into them. They find that they vary considerably in mileage and they think it is more luck than the manufacture when they get a good set.

I might run down a number of products and show you that the buyer of products reacts toward the product in an entirely different way from what we suppose.

We are too much engrossed by the technique of our business to know what the other fellow thinks about it and our sales approach and how merchandising arguments are affected by that fact.

Then we have been merchandising cars and trucks without having divided the buyers up into their ordinary groupings and know how they are affected in their purchasing by those groupings. It is interesting to me to know how many trucks are used in the different lines of industry, but I am sorry to say that I am unable to find from the truck manufacturers themselves any who knew which was the biggest market and the next, and the next, and the number of trucks that entered into each market. They are unable to divide their market up and consequently they do not know how to approach that market.

Then we have not determined how the division of the market affects the product itself; how much people are willing to spend and what they demand in the way of individual differences for the expenditure. There are a large number of small concerns building a few trucks a year. They are doing a successful business because they are building the bodies of the trucks to suit the individual requirements of the individual customer and building the service to suit the requirements of its customers. We have not measured how much the divisional groupings of the market require a change in the product to meet those conditions, because we have not studied the probable reactions of the buyer sufficiently.

Similarly, we have not measured the channels of distribution. I was mentioning again at luncheon to Mr. Clark the subject of branch houses for the tire people and I mentioned the fact that very few of the tire manufacturers know that the branch house came into the rubber business long before the tire was a real factor, it being the mechanical goods that they originally carried. Tires were simply added later on to those other lines.

We have not understood what are the normal channels and what are the abnormal channels of distribution. We think we can talk about eliminating the jobber and going to the dealer, eliminating the distributor and going to the jobber and going to the consumer as if it were a matter of decision. These lines of distribution have been worn deep by custom and tradition and habit of buying. We cannot simply break down those banks and put the stream in any other channel by a mere decision. We have not learned why certain lines of goods were

distributed in one way and why some others had found another channel.

Furthermore, in the automotive buying or merchandising we have not yet determined the relative importance of standardizing lines or of individualizing them. Every merchandising effort is an attempt to take your product out of competition and give it an individual character. You wish to take it out of the general acquaintance and put it into a personal friendship; that is, take it out of the competition or comparison and put it into an individual place for itself. So that every merchandising effort is to individualize the product. Time after time when the problem comes up to us in the shop, a manufacturer wants to duplicate what the other man is doing, he wants to make a package of about the same character, he wants to make a product of about the same character, and wants to go through the same methods of sale organization without determining the fact that he must attempt to individualize his work. That individualizing will rest upon certain points of difference.

Instead of attempting to differentiate himself from the others he attempts to classify himself with the others and makes it more difficult to overcome the sales resistance. We have not measured the value of standardized practice and the value of individual methods in merchandising. We have been largely impressed by the value of standardized practice in production and suppose that the same thing operated in sales.

Finally, we have had no basis for measuring the value of merchandising operations outside of the personal salesman. We know how to measure the personal salesman because we look at his order book and the credits at the end of the year. We know what he has done—what we have delivered—and we can measure his value upon that basis. In advertising—that is the mass salesman—sales promotion of various kinds, we have no means of measuring their value. We do not know how much our advertising has contributed to the sales; we do not know how much our sales promotion work has actually increased value, and we are frequently without any information which would indicate the extent of service we can allow and the character of that service. We have no basis of measurement of these points and, consequently, we are always experimenting, hoping to arrive at some groundwork, without any analysis being made and always arrive with no basis of measurement in the end.

So long as times are good we will accept the expense for advertising and the requirements of the service and O.K. them, without any understanding as to why they are in that shape, but when times are bad we ruthlessly cut them in two and cut off one-third without any understanding of the reasons. Why? There is value in all these methods, but most of the value lies in the human reaction and not in the statistical information. Out of a thousand things that pass your vision to-day, you record one on your consciousness. Out of a thousand things that are put before your eyes, pass your eyes, in advertising, out of a thousand sounds that hit your ears you select one or two to be remembered or recorded. It is automatic. How do we know that the advertisement we are putting out to-day will be one of the thousands that will be rejected or one of the few that is remembered? On what basis do we measure that?

We simply go blindly into the market and throw out our advertising matter just as if I threw it out of the window here, in the hope that people would pick it up as they go along the street. For this reason we waste a tremendous amount of effort in our sales promotion and sales work. We do not know why people act and, therefore, we cannot arrange our methods to agree with their reactions.

As a matter of observation and effect in advertising, in the mass sales work, people react to very few things. If you will think back and analyze yourself from day to day you know that there are very few things that interest you, very few; your business, certain portions of your business, not all of it in detail, your surroundings at home, certain things about it, certain things about your social life; there are very few that you examine in detail or are interested in. You probably look at half a dozen things and you are through. That is the extent of your examination and interest.

Now those interests govern your reactions very closely and if I wanted to have you react pleasantly and favorably to me I must know your interests and apply my own interests to those interests, and not only that, but also at the time you are interested in them.

There is no use for me to get you interested in the details of your business when you are wondering if you will make the put on the ninth green.

There is no use of me trying to get you interested in reference to details about church work when you are just stretching for the seventh inning.

The associations that you have are separated very carefully into compartments. The interests that you have are differentiated so that you will take up one interest where it belongs at the time that you are working on that.

If I want to advertise to you, impress you and get the recording of my impression on your consciousness, I must suit my interest to yours.

We do not do that very often. We have so large an amount of technique, without fundamentals, in our work that most of our work is scattered all along the surface, whether it touches our customers or not.

We presuppose that other people are interested in the things we are interested in. I am presupposing you are interested in this address—the chances are you are interested in a small part of it and probably will not remember more than one thing. You will forget all but a sentence or two. But personally I am apt to presuppose you are interested, because I am interested. All through life we are conducting our business on the presupposition that other people are interested in the things we are doing. We go ahead blithely telling about our production without knowing the other man's interest. Frankly, before we get very far in merchandising, we must be able to step outside our own interest and watch the people objectively so that we will not be submerged in our own technique when we approach the other fellow. Merchandising in the automotive field is no different from any other.

The merchandising outlook is good provided we have the intelligence to tell the people that we will meet their problem and can give them what they desire. They desire automobiles—they desire automobiles to run. They expect to have them continue to run and if we intelligently work out our problem I do not think we shall have any fear of the business.

A NEW rust-proofing process, which has been successfully used for bicycle parts, has been evolved in the research laboratory of Rudge-Whitworth, Ltd. This consists in boiling the articles to be treated in a solution of hydric-phosphate of iron which produces a dark gray finish practically immune from the attack of rust. It is said to be very much more rapid than Coslettizing and has no effect upon either the strength or temper.

What You May Expect From Foreign Advertising

Again it is said here that foreign advertising, and we might add merchandising, is not distinctly a different problem. Advertising and selling, like the people, are not vastly different because of the lines on maps.

By A. B. Cole*

FOREIGN advertising is an investment to insure sales, and when it ceases to be an asset it is time for the liability to be wiped out. Many concerns have treated their foreign advertising as a side issue, and carry it as a heavy liability, owing to the lack of proper co-ordinated sales and advertising effort behind a set campaign or advertising program. It is natural to expect just as much from your advertising appropriation as from any plant investment. A certain investment in advertising can be made to produce returns that will parallel, if not exceed, any other investment of equal amount.

It can be made to—

Add to sales directly,
Add to sales indirectly,
Create good will for manufacturer and commodity,
Change living conditions,
Analyze markets,
Discover demands for products when none appears to exist,
Open channels of distribution,
Successfully counteract resistances both active and passive.

It is gratifying to observe that there are many large organizations using foreign advertising to search out the markets of the world. However, we need a more universal revision of our sales organizations on the part of the medium sized and small manufacturers in this country. Many of these companies are doing 25-, 50-, 100-, and in some instances a few hundred thousand dollars' worth of business a year, and were the executives of many of these companies to take a greater interest in their foreign trade and rightly use the experience in what has made them what they are to-day, co-operate with their sales and advertising departments, their foreign trade would increase rapidly. This rightly applied will place their export trade on a permanent basis. Some small manufacturers are doing a large foreign business, and in every instance it will be found that they are conducting their foreign trade along fairly practical lines—in other words they are thinking internationally.

Then, again, there are larger interests that should be selling their products in every country on the earth, who are practically doing nothing. Their foreign sales promotion and advertising methods are haphazard, they are not concentrating on this commerce of the highest order. On account of the wonderful experience some companies have passed through during the last few years, they have overlooked the greater factor that makes any industry worth while—that of business building for the future—that great insurance which not only sells service, but causes one to point to a particular concern as a great international institution.

A plan is essential; know first what is desired to be accomplished; then as a general would deploy his armies, divine available forces to overcome obstacles. These forces must be used in their proper relation to each other, and, speaking of forces, international salesmanship in its broadest sense is meant.

Generally speaking, there are two kinds of selling: making use of existing markets, or being an opportunist; and making markets and using creative salesmanship.

ADVERTISING is nothing more than creative selling; and sales promotion in its final analysis consists of the use of three mediums:

Space—this includes from newspapers to motion pictures,
Direct-by-mail merchandising,
Salesman.

The foregoing media must be used; some or all, according to the necessity of the products or scope of the company.

After all, building up a foreign trade is nothing more than creative selling.

The foreign field is looked upon by many as a mystery. Certain localisms influence the judgment out of all proportion, owing to the lack of an international mind. Because toast has never been used as a food in Japan is no proof that a market cannot be built up for electric toaster stoves—educational work may be necessary first.

Advertising in its true sense can be used, and will produce a pre-determined result, provided proper analysis has been made of fields to be covered.

Like investing in anything, consideration must be given to the question, "Will the returns warrant the expense?" It is surprising what can be done with a limited appropriation—if care is taken to be sure every part is co-ordinated.

Human nature is very much the same the world over. Under the skin we are similar. There are certain appeals which apply to all of us and if these appeals ring with sincerity they are just as effective in Brazil as they are in China or the United States. Speaking of appeals, we mean those which affect the emotions—fear—comfort—gain—fight or pride.

Granted, the general physical conditions of a race must be considered. The so-called Latin does not like to be hurried, consequently "pep" copy lacking dignity would not pull as well as good descriptive sincerely logical copy with, perhaps, the pride appeal. Of course, the "copy" would depend upon the commodity and the locality.

*Director of Publicity, Westinghouse Electric International Co. Paper read at the Eighth National Foreign Trade Convention.

If we consider the underlying emotions common to all, the problem of foreign trade is not nearly so complicated in its fundamentals. True there is naturally, due to the wide field, a mass of detail, but this after all can be classified until it becomes mere routine.

If you have a product of merit, the thing to do is go out and sell it. First, find out how great a resistance you have, perhaps using advertising to determine this; marshaling the means available so that each and every one does its full complement of work, eliminating everything that does not help in the plan. If it does not help, it is a hindrance.

Creative salesmanship, energized by the master force visualization, sells the goods. This is true, but visions and products of the imagination, while wonderful are merely idle dreams until will power and hard work put foundations under them, after which they become realities. And the tool with which to build the foundation of any business, whether it be a corner grocery or international company, in "character" is advertising. However, it must be employed with as much care and common sense as in the buying and selling of any commodity. Return on investment in advertising should be in proportion.

Customs change overnight; they are after all only the surface. Some ten years ago all the Chinese wore queues. They were gone almost overnight. The advisability of catering to customs should not be discounted; they are an entering wedge.

We think of the customs of a country. We hear much of it these days, but in the essence what is selling anyway, but the changing of customs, the changing of another mind to conform with your ideas? It matters not whether the idea is good or bad.

Being specific, as to what may be expected from a foreign advertising appropriation, one of the primal results should be a world-wide or a country-wide acquaintance with the manufacturer, large or small, wherever advertised, namely, institutional advertising. Although many do not agree as to the value of institutional advertising, in many instances remarkable results will be obtained from a well planned campaign of this nature. Particularly gratifying results are obtainable from native mediums and with such a campaign, followed by a definite consumer campaign of commodities, a good foundation is laid.

It is highly essential that all advertising activities be properly supported by appropriate window trimmings where possible, and by well planned, and executed, dealer and consumer literature.

In export merchandising, the returns from this angle of advertising are in proportion to the aggressiveness with which the field organization as well as the home organization works. You can lead a horse to water, but you can't make him drink. So it is with the heavy machinery salesman. While he may occupy a prominent position in his own little sphere, his gross sales could be increased many times were he to analyze and dig deep into the desires and requirements of the merchants around him. Proper merchandising should always be sold with a resale feature in view. Thus, many times the aggregate of a salesman's efforts in selling merchandising lines is often greater than heavy machinery sales, on account of the duplicate mail or repeat order.

There is one advantage that we must remember in relation to our foreign competitor, and that is, the foreign house does not help his dealer move the goods off his shelves as we do. He does not feel obligated to furnish all the dealer helps that are prevalent among our up-to-the-minute advertising and sales organizations.

The Latin-American, particularly, is fast becoming cognizant of our business methods, and it is gratifying to say these methods are being favorably received. If you can show a merchant how by better merchandising he can turn over his investment several times per year instead of once, he is not going to forget the favor; and your advertising backed by such sales promotion efforts will more than pay out handsomely.

Above all, the foreign advertising appropriation should produce confidence in customers, stimulate consumer demand and keep goods sold.

As a facility for handling foreign advertising, the great importance of using a first class foreign advertising agency must not be overlooked. In this connection these points must be duly considered:

1. A foreign advertising agency is a prime essential for any extensive export operation. However, this agency must have had world-wide merchandising experience.

2. The advertising manager of a manufacturing company can obtain the best results if he does not overlook the fact that it is highly essential that the agency have his utmost co-operation in order that it may become conversant with the technicalities of his marketing problems. It stands to reason that an outside organization, being retained to assist any manufacturer, should not be expected to be any more than space brokers if the advertising manager does not assist the agency from all standpoints. If co-operation for the ultimate success of an undertaking is required, it is certainly the case in this particular relation.

3. In many instances, foreign advertising of a manufacturer depends on what the manufacturer is to-day. Too many manufacturers treat this subject as one totally foreign to their business, while in reality it is the domestic business told in another way.

4. Practical experience must be injected into foreign advertising.

The foreign agency should be treated in the same way as the domestic agency—such procedure is imperative.

The success of an advertising appropriation does not depend wholly upon media and copy, but the whole plan affects the net result.

American manufacturers must extend this world-wide facility—trade, and this can be obtained only through the co-operation of all the departments from the president to the various committees, down to the shipping clerk.

Who of you have considered these factors in order that proper analysis of your foreign advertising might be assured?

Here we have some of the factors that insure success in foreign advertising campaigns.

All efforts must be closely allied with the local advertising and trade paper compaigns in the particular countries through the assistance of the field organization.

The field organization must be completely sold as you proceed to unfold this profit-sharing method of advertising. Bear in mind that you must make advertising profit-sharing if you would succeed. It is hardly necessary to elaborate on the different forms of advertising, so similar in many cases as that adhered to in this country, such as local advertising in newspapers, trade papers, and bill posters, all of which you are familiar with; and then there is general advertising literature, specially printed matter designed for dealers' use; circular letter campaigns, and all these that I have enumerated, you realize the value of these campaigns. Why we do not adopt these methods more nearly universally in foreign trade is a great conundrum. The common procedure, if put into effect, should place us in a position that we are bound to succeed beyond all expectations.

Recording results from advertising is a real asset—

is a key to the future progress in the development of foreign trade. The most efficient way is the card system, with a practical follow-up plan. The inquiry that you received six months ago may have cost you 35 cents or $35. Perhaps it can be turned into a substantial order if you will review the hidden information within your business. I believe that the loss from neglect, improperly following up of prospects and proper handling of correspondence, has cost our country millions of dollars and much prestige in foreign trade. You may have had a remarkable sales organization; the new era of things will demand that you become as familiar with the facilities of your agents and branches in Hongkong, Buenos Aires, and Melbourne, as in the instance of your Chicago, Cleveland and New York organizations. An agent or a branch of a manufacturer abroad is an integral part of the successful advertising campaign.

The expression "foreign trade" covers a vast amount of territory and one is prone not to analyze intensively the changing conditions of the factors that make up the whole undertaking.

"What I May Expect from My Foreign Advertising Appropriation," gentlemen, is exactly the mission set forth by my company for establishing its policy.

1. We expect that the Westinghouse Electric International Company shall be known favorably throughout the world.
2. We expect that the foreign buyers of the commodities which we make shall know us to be a fair and honest house.
3. We expect that the salesmen representing us in foreign countries shall be proud of the fact that they are working for such a company as ours that is backing them up in every way possible in giving them the entrée, and in assisting them in sales, that the business in their territory be increased and that the great godsend to humanity, the uses of electricity, shall be known all over the world.
4. We expect the dealers and distributors who are handling Westinghouse products to be as proud, as the agency for our goods, as we are proud to have them for our agents.
5. We expect that every dollar that we are expending for foreign advertising to-day will be planting seed of such productivity that it will come back to us in manifold increased sales.
6. We expect that the good word which we are spreading of our company and products shall last for all time to come, so that the name of the Westinghouse Electric International Company shall be the paragon for a good fair company which sells the best kind of goods it knows how to make.

Our foreign organization operates through the arteries of all civilized countries of the globe, covering a wide range of products, 300,000, touching over 500 industries, thus including anything electrical from a giant railroad locomotive to milady's curling iron and baby's milk-warmer.

We are offering engineering advice to many peoples on the earth. This is the world-wide vision that American manufacturers must inaugurate. It is this method of capitalizing the dollar that pays dividends. It is the contribution of this service that will give the world a more convenient "to-morrow."

It is this service that industry must render the world's commerce—one of the greatest missionaries for good, and, gentlemen, the effort that you put forth in behalf of foreign trade is going to make you and your industry bigger to-morrow. And remember that international trade affects every fireside in our great country. It is one of the serious problems with which we are confronted. The great manufacturing institutions of this land realize it. They propose to render this universal service to the world, and it is only through service that any institution has the right to exist.

The company with which I have the honor to be associated has always taken a broad viewpoint of the commerce of the world, like similar institutions unselfishly placing its huge organization at the command of the trade at great cost, along lines that are not prefixed with a dollar sign but basically having in mind the duty to help others, and thereby lessen the burdens of the peoples of the earth.

Automobiles in Japan

THE following extract from a recent issue of the London *Times* gives some interesting data on the status of the automobile and truck in Japan.

"The use of motor vehicles in Japan greatly increased during the war. In 1914 Japan possessed 353 motor cars and trucks for hire, while 713 were privately owned; in 1915 there were 419 of these vehicles for hire and 825 privately owned; in 1916 the numbers were 566 and 1082; in 1917, 1291 and 1381, and in 1918, 2473 and 2060.

"The registrations of motor cars, cycles and trucks show that these vehicles are chiefly used in the larger cities and towns. The country roads are not adapted for motor traffic, although this defect is in course of being remedied. In December, 1918, 1975 motor cars and cycles and 104 motor trucks were registered in Tokyo; 423 and 5 in Yokohama; 421 and 32 in Osaka; 263 in Hyogo (Kobe); 184 and 4 in Kyoto; 146 and 14 in Aichi (Nagoya), and 918 and 50 in other towns. On Sept. 8, 1919, 968 motor cars and cycles and 119 trucks were registered for hire and 1153 cars and cycles and 119 trucks for private use; in Tokyo an increase of 280 vehicles; while in Yokohama, 252 cars and cycles were registered for hire, and 286, with 8 trucks, for private purposes, showing an increase of 93.

Since March, 1918, the Japanese Government has attempted to stimulate Japanese manufacture of motor trucks by giving a bounty for each truck built in the Empire according to military specifications. These trucks may be used only in Japan, and must have a capacity of one ton or upward. The bounty paid does not exceed 400 yen (£40 at normal rate of exchange) per truck, but an additional sum of about 100 yen is granted for trucks used or hired out by a manufacturer. The owner of a truck receives a bounty of 200 yen, and is granted 60 yen per annum for five years toward its upkeep. Owners of imported trucks also receive some 200 yen per truck, and an annual grant of 60 yen for upkeep; these bounties are, however, paid only to Japanese subjects.

"The narrow crowd-thronged streets are prejudicial to the use of motor trucks, especially those required for speedy delivery of goods. Tokio, Yokohama and Osaka will probably be the chief market for motor vehicles until roads and bridges are improved in the smaller towns.

"More cars are required for purposes of hire than for private use, and the demand for taxicabs exceeds the available supply. There are motor omnibuses in Tokio which charge lower fares and render better service than the electric street cars. Small or medium types of passenger cars are generally preferred. There is a big demand for closed private cars on account of the dusty condition of the roads."

Prominent at S. A. E. Summer Meeting

(1) J. A. Edwards, (2) L. R. Davis, (3) C. I. Bradley, (4) C. S. Morrison, (5) C. D. Cramp, (6) E. B. Reeser, (7) J. H. Wogenhorst, (8) J. M. Heald, (9) A Tennis Match, (10) Standing Broad Jump, (11) The Presidential Nominee in an Unofficial Pose, (12) J. C. Long, R. H. De Mott, C. R. Mabley, E. B. Taylor, H. E. Brunnel, (13) S. Barin, N. Mac Coul, (14) F. R. Pleasonton, (15) L. W. Wainwright, (16) Victor Pagé, (17) J. A. Green, (18) Wm. B. Stout, (19) Wm. E. Williams

Hub and Wheel Standards

Editor, AUTOMOTIVE INDUSTRIES:

The articles by John Younger, published in AUTOMOTIVE INDUSTRIES of March 10, and W. J. P. Moore, published in the April 28 issue, have been read with considerable interest, and it is apparent that there are several other viewpoints on this subject of wheel and hub standards which have not been expressed in either of the above letters.

These articles would give the impression that the automotive industry exists primarily to furnish employment to certain classes of workers of which one is the automobile engineer. This is evidenced by the phrase, "there is a lurking suspicion in the back of my mind that such a standard may lead to loss of individuality." It is undoubtedly true that standardization may result in a certain loss of individuality to the engineer.

However, the industry must face this fact: The American public has let it be known in a most emphatic manner that less expensive automotive transportation is demanded. The problem of the engineer, therefore, resolves itself into the question of how best to discover the method whereby the decreased cost of automotive apparatus can be given to the public.

If this decreased cost can be obtained through the multiplicity of designs and through the free expression of the various idiosyncrasies of designers as exemplified in the 257 odd motor truck hubs and wheels which we now have, in place of the 10 or 15 necessary to fill the field—then no change need be made in our present practices.

If, on the other hand, we are to exhaust every avenue looking toward the production of more economical motor transportation, then serious consideration must be given to the reduction of the multiplicity of designs, and this invariably leads toward standardization.

This standardization is bound to come about whether under the auspices of automotive engineers or under the control of some one manufacturer or group of manufacturers. We already have one-half of the passenger automobiles made by one manufacturer. Certainly, this one-half is standardized. This brings up the question as to whether the cost of motor truck transportation will be reduced by standardization or by any other available means, or will some manufacturer develop who, through economical design and production, takes over one-half the motor truck industry as has already been done in the passenger car field.

Certainly, a standard that involves 10 hub castings, with the corresponding hub designs on complete wheel castings, and which does the work of 257 designs in the range from 1½ to 7-ton capacities, promises a maximum economy in front wheel production. Economies should certainly be expected from the steel wheel maker, the wood wheel maker and the bearing supplier and the axle maker.

The economy in direct cost of the motor truck need not stop as a result of this standardization but would extend also to the maintenance of motor trucks. One of the serious complaints of motor truck operators is the excessive cost of repairs and the loss of time represented by idle trucks while making repairs. The adoption of a standard front hub and spindle design will operate toward more economical truck maintenance for the reason that if the service department of the "A" truck does not have the requisite parts, the owner of the "A" truck can, in all probability, obtain service from the "B" truck agency.

In addition to the above economies, competition between the manufacturers and agencies should lead to reduced cost of service to owners which in the last analysis would be beneficial to the motor truck industry.

A word as to the economic side of motor truck development as affecting standardization should be of interest. The motor truck as it stands to-day is the development of many years' work—the almost life work of many engineers—in bringing the motor truck to its present stage of development. It therefore represents what the automotive engineering profession considers as essential in motor truck construction as evidenced by its approval of existing designs and on the basis of these designs, we have certain necessary selling prices, which prices are based on the most economical present day production costs.

This is the problem on the one hand. On the other hand we have the great American public which, within the past nine months has rendered its verdict to the effect that motor truck costs are too high and must be reduced. The new problems for the automotive engineer, therefore, is to comply with these insistent demands and develop motor truck apparatus that can be sold and operated at a considerable reduction in cost. If these premises be granted, it follows that the motor truck manufacturer in the immediate future is going to be successful in direct proportion to his success in meeting these new demands of the public for motor truck transportation.

The article of April 28 goes into detail as to the type of bearing that should be used on standardized wheel equipment for motor trucks and brings forward the statement that the ball bearing is the recognized world standard in every civilized country of the world outside of the United States. We do not know whether we are to infer from this that the good old United States is backward as regards its civilization, as evidenced by its quite general use of the tapered roller bearing in motor truck wheels. We do not believe the writer intended to convey that impression, but he evidently overlooks entirely the fact that the tapered roller bearing has now been adopted by some 66 European manufacturers of automobiles, and as regards world-wide distribution, it should be of further interest to note that it is available in the great distributing centers of the world, and that bearings of the one standard are manufactured in two plants in America and one plant each in England and France.

There should be no hesitancy, therefore, on the part of the American engineers in using the type of bearing that has made itself by service the recognized standard for motor truck front wheels, as this bearing is available for production and for service practically the world over.

The article of April 28 goes into much detail as to the standardization of other parts of automotive apparatus, much of which has not yet been brought before the

Standards Committee. It is our firm belief that as regards the type of axle for rear wheels, the best sections for tires, the method of attaching tires, it will be found when these matters are studied closely that many of these problems have already standardized themselves and the work of the Standards Committee will consist largely in discovering these "natural" standards and presenting them in a condition to be of greatest benefit to the automotive industry.

It is far from the writer's intention to go into detail on such matters as tire standards which have already received attention from, and is in the hands of, recognized specialists on this particular subject.

T. V. BUCKWALTER, Chief Engineer,
The Timken Roller Bearing Co.

Vital Importance of Mr. Tipper's Articles

Editor AUTOMOTIVE INDUSTRIES:

The articles in AUTOMOTIVE INDUSTRIES by Mr. Harry Tipper have been a source of great satisfaction to me, and I have been frequently tempted to write, congratulating you on the manner in which you are giving publicity in a proper place to facts which are of such vital importance and yet are so generally ignored by those who should give them greatest consideration.

As a member of the engineering organization in various corporations I have had ample opportunity to observe the losses both to corporation and factory workers from lack of sincere regard by the management for the workers. I have also had opportunities to try the opposite treatment on a moderate scale and have had the pleasure of seeing the men respond with far greater effectiveness than I had reason to expect.

Lacking the ability myself for such publicity work as Mr. Tipper is doing, I take great pleasure and satisfaction in reading his articles and in the knowledge that the work is being effectively and persistently carried on.

THOMAS S. KEMBLE.

Cleveland, Ohio.

Non-Corrosive Hard Metal Wanted

Editor, AUTOMOTIVE INDUSTRIES:

We are interested in securing information from concerns who can supply a non-corrosive metal as hard as steel and of 60 scleroscope test, to withstand the action of copper sulphate; probably a material that is high in nickel and copper. This material must be capable of being machined, hardened and of taking a high polish.

We wish to exclude stellite, monel, duriron and stainless, as for various reasons these materials do not satisfy the conditions as observed by tests.

DIAMANT TOOL & MFG. CO., INC.

Army's Interest in Highway Transport

HOW intensely the Army is interested in the work of the Highway and Highway Transport Education Committee was well stated recently by Col. Mason M. Patrick, in an address at one of the public meetings of this committee. After describing in some detail the army's transport problems in France, Col. Patrick said:

"Now, just a word concerning what the army itself is doing to further the highway and highway transportation movement. You have no doubt heard of the opportunities which are being given to men to learn while they are soldiers, to train themselves in order that they may be better citizens when they return to civil life after their brief service with the colors, and it is in just such schools that we are trying to fit them for real, useful work in connection with the enormous problem of road building, of traffic control, and of motor transportation.

"There are open to all these men numerous courses, for any of which they are encouraged to volunteer, and there have been engaged men as teachers who really know their jobs. It will be understood that we are taking a large number of young men who would never have any college or university training and many of whom lacked even the advantages of high school training. While we have no ambition, desire or intention of turning them out as college graduates, we do believe that in their three years' term of service we can make them better men, better able to earn their living, and with a sense of respect for law and order, which is a wondrous asset when possessed by the citizens of any country, and the lack of which may prove a country's undoing.

"In these army schools there are now enrolled 40,000 men, and they are taking courses according to their own likings, carefully guided, of course, but still leaving to them a large measure of choice in subjects as varied as music, stenography, dramatic art, blacksmithing, automotive trades, etc. Among these courses we hope to incorporate some which will fit many of these men to take minor positions with State, county or other organizations which are engaged in developing their highway systems. We hope to have given these men practical courses which will familiarize them with the materials employed, which will fit them to be foremen, or to operate any of the machines which are employed in highway building.

"Others will be given instruction in the management of motor transport, particularly with a view to fitting them to become what, for want of a better term, we may call fleet managers, men who will be capable of conducting numbers of motor trucks running between different points and transporting goods. To my mind this is one of the problems we now have to face and for which we must find a solution.

"Nearly two years ago, in writing to a young man asking advice as to the course of study he should follow to fit himself for his life work, I suggested this idea. It seemed to me then, and I think it is more apparent now, that in the future vast quantities of materials will be carried on our highways in these vehicles, and in order that this may be done most efficiently and most economically, it is essential not only that there should be men who know how to conduct them individually, but others who know how to combine them into large or small fleets and to manage such combinations in a way which will prevent delays, which will hasten the journey and which will do this without danger to other users of the road.

"The army's highway transport problem is to be assured that the roads over which it must operate are suitable, that they are sufficient in number, that they are properly located, and that the motor vehicles which we can procure will likewise be suited for army use. That this problem is solved aright is of importance not alone to the army but to the entire country, and we wish to assure all those who are as concerned as we with the prosperity and with the welfare of our country that the army will aid in this movement by giving all of the encouragement and help it can afford and by furnishing all of the information it has acquired concerning roads and motor transport."

Importance of Human Wastes in Industry

It is easy to recognize difference in economy between two machines. It is more difficult to determine causes of labor waste in producing these machines. Human waste can be determined only after the production effort. We have no method of measuring human capacity to produce.

By Harry Tipper

DR. GRIMSHAW, in an address upon economic matters, at a meeting of the faculty at the New York University some years ago, pointed out that labor was the only value. Nothing is of any value until labor has been put upon it, and its value is in proportion to the amount of labor required for its discovery and fabrication.

When industry is measured from the finding of the material to the use of the product, there is no value except the value of the time and effort which is required to bring it into usefulness. In the average individual establishment, the importance of the labor cost is understood but the elements of labor waste do not receive the same study. The direct labor used in fabricating the product is only a portion of the amount going to make the cost of doing business. Indirectly, of course, we are paying for labor when we pay for raw materials, buildings, machinery, printed matter and everything else that enters into the cost. Capital itself is only the product of previous labor stored in convenient form for use in providing future production.

When the matter is pursued logically to its final outcome, Dr. Grimshaw is right; there is no other measure of value except labor and all costs are outgrowths of labor costs. Without knowing the economics of it most of us are sufficiently aware of this to apply prices to labor cost automatically. The discussion of costs among individuals, in newspapers and in other public prints begins and ends with the labor question.. Whether we regard it as a problem or not, the question of labor is the paramount question at all times in industry, and the future of industry depends entirely upon progress in the direction of labor efficiency.

Labor cost must be measured in time. There are other factors entering into it, of course, but these also are questions of time. The rarity of the skill demands a greater payment because the time is limited and such skill can exercise itself only during that limited time.

A physician who is able to perform an unusual operation with success is paid an unsual amount because his individual skill is rare and he can only work the length of the day. He cannot duplicate his own skill. Similarly men who can organize their own work and organize the work for others receive more money, because that capacity is not usual and the exercise of it is worth a great deal of unorganized labor in the elimination of time and effort.

When all the modifications are considered, however, the problem of production is the problem of the amount of time required to do a piece of work at a given cost per unit of time. Even in the case of piece-work, it is the time which counts and payment by the number of pieces is an endeavor to secure a larger number of pieces for a given time.

The most important wastes in industry are the wastes of human endeavor. We have been very capable of measuring those wastes when they have been translated into materials, machinery, buildings and other tangible products. It is easy to recognize the differences in economy of two machines for a certain piece of work. It is much harder to determine the causes of the labor waste in producing these machines.

Limited as we are by mechanical measurements, we find it impossible to apply any measurements at all to the human being, and, therefore, our labor wastes are only determined after the production effort has been made and not before. When the man has produced his piece of work we can measure with fair accuracy the comparative value of the product. We have no means of measuring his capacity to produce nor the elements upon which that capacity depends in harnessing it to useful work.

While we recognize therefore the fundamental importance of labor, our discussions regarding it are arbitrary and without any sound basis of consideration. We cannot compare labor capacity and waste because we do not know either the possibility of practical improvement or the factors which will bring it into practical result.

In organizing the present work of industry, we have arrived at the point where the mechanical organization is sufficiently complete to be improved only with decreased speeds. So much past effort in the form of capital has gone toward the making of equipment which we use, so much ingenuity has been expressed in its improvement and it has become so large in its proportions that a measurable addition in the efficiency of any of its details can affect the total result but slightly.

This improvement may be lost through a slight decrease in the human efficiency or the mistakes of our organization from the human standpoint. Already in some instances, this difficulty is showing up so that within the next few years it will have a real influence upon the cost.

In the endeavor to secure accuracy from workers who do not understand the value of that accuracy, we have added to the supervision with systems of inspection handled by men who are themselves igno-

rant of the real importance of the work which they do. In some large industries, this centralization has gone so far that the improved machinery has not increased the accuracy materially in the last few years.

In some instances of effective organizations grown to an enormous size, the percentage of spoiled work has not decreased with the improvement of the equipment and the increase in the supervision.

The time of labor scarcity preceding the present depression showed the effect of decreased human efficiency upon costs and the great variation in human efficiency existing in plants of the same character drawing their labor from the same local market. This variation is the most important point of examination in considering organization changes calculated to increase the human efficiency.

As soon as the scarcity of the labor period was passed the human efficiency increased in many lines of industry within a few weeks, twenty or twenty-five per cent. Between plants in the same line of business and in the same locality, the difference in the human efficiency of labor ran as high as fifty per cent. Such variations in cost are too important to be neglected, they involve the whole economic position of the establishment. The reasons for the differences are worth examination and organization changes should not be frowned at where they offer a reasonable basis of increased efficiency, even though it may take some time to establish them.

One of the faults of the present mechanical system of organization has been the centralized control. It became easy to centralize all planning and all developments in the hands of a few executives as the systems of communication and transportation grew more rapid and more complete. These centralized systems reduced many of the supervisors to the position of the worker in their capacity to understand and their ability to conduct their operations in the business.

In many of these centralized systems we have endeavored to secure an understanding from the top over a large group of thousands of men, instead of securing it with the individual and in the small group. The responsibility has been limited to such a degree that few men have developed either an understanding or a capacity for decision in connection with their work.

These are elements which reduce the human efficiency or prevent it from developing. Inasmuch as labor cost is the important cost in industry, increased labor efficiency is the important problem of industry and future organization changes must be based very largely upon their ability to improve the human efficiency of the plant.

Health Service in Industry

A RESEARCH service financed and supported by employers is pretty certain to investigate and discuss questions of practical and immediate value to the production and organization problems of its subscribers. For this reason special interest attaches to the bulletin on "Health Service in Industry" recently issued by the National Industrial Conference Board. Aside from the carefully gathered and well-presented information which the pamphlet gives, the mere fact of its presentation indicates a growing realization of the importance of industrial medical work along with the other human factors related chiefly to a study of and attention to the individual.

The purpose of the bulletin is "to present a survey of what has been accomplished in the development of . . . the Medical Department, and to discuss methods of procedure which have been applied in individual establishments." It is based on material gathered by investigators and from questionnaires.

Much of the general material presented is worth the attention of every executive, although a number of pages are devoted to extremely detailed data concerning physical examination standards, etc., and will interest only the active medical worker.

Some of the most interesting paragraphs relate to the function of the physician in industry. After discussing the gradual development of medical work in industry, the bulletin says of the modern industrial physician: "The physician who confines his activities to the four walls of the plant dispensary is found to be of but limited value to the industry with which he is associated. It is only as his influence reaches out into the operating departments that his full possibility of service is realized." Some of the chief functions of the plant physician discussed are as follows:

1. Curative and preventive activities. This is simply the work that every plant doctor does.
2. Seeing to it that only men physically qualified for certain kinds of work are placed and allowed to continue in that work.
3. Physical examination of workers.
4. Place employees in work for which they are best fitted from physical standpoint.
5. Study the degree of hazard in different production operations and suggest protective measures to meet each situation.
6. Care of health of executives.
7. Care of hygienic conditions about the plant; such matters as proper lighting, heating, ventilation, toilet facilities, fatigue work, etc.
8. Assist in proper adjustment of disturbing factors in home life of employees.

This is a summary of the chief factors discussed in this connection. Many persons will differ with some of the conclusions arrived at, as well as with some of the functions included in the list. The discussion is interesting, however, as much to bring out points of difference as to provide information and instruction.

Other factors discussed include statistics concerning the extent and character of health supervision activities in a large number of New England industries, proper methods of staff organization for the medical department, the equipment necessary to meet ordinary plant dispensary needs, methods and types of first-aid work, uses and methods of making physical examinations of employees and the value of medical records. The entire pamphlet is well worth attention, although certain minor points may meet with considerable question.

ACCORDING to one authority about 75 per cent of the gasoline produced in the United States is obtained by direct distillation from the crude. About 10 per cent comes from natural and casinghead gas, while only 15 per cent is produced by cracking processes.

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Secretary Hoover's Attitude

THE recent meeting between Secretary of Commerce Hoover and the committee representing the automotive industry was doubtless much like the similar conferences that had preceded it. The manufacturers present were frankly doubtful when they entered the meeting. They left with the firm conviction that Mr. Hoover had no other idea than to help business in any and every way possible. Also the visitors left the conference convinced that Mr. Hoover well understood the broad fundamentals of business.

It was something new to the automotive manufacturers to have it called to their attention that their business status was of vital interest to other industries. At first the members of the committee were exceedingly cautious in promising figures. After Mr. Hoover had made it clear that he personally was not at all curious about these figures; that he was interested in them only as they contributed to the general picture of business, the manufacturers got a better grasp of his plans and came forward with an offer to contribute their part to this general picture.

It was especially interesting to hear Mr. Hoover say that he did not desire to force any figures from any industry. He wanted all figures to come to him voluntarily. This attitude has done much to disarm those who have been in doubt as to his real object in gathering business data.

Need for Simple Tests of Lubricants

AT the recent meeting of the Society of Automotive Engineers one point emphasized was the need for simple tests calculated to determine the value of lubricants. A large proportion of the oils used in motor vehicles to-day are sold through garages and service stations, most of which have only the haziest notion about the real value of the lubricants they buy and sell. It would seem that simple apparatus for measuring viscosity and determining the presence by means of emulsion tests or otherwise of sulphur compounds could be readily devised, and with advantage to all concerned be placed in the hands of oil retailers, if not of the actual consumer.

There are, of course, other tests for lubricants which can be made only by trained laboratory men, but the foregoing tests are not so difficult to perform, providing a simple and inexpensive apparatus were available, with sufficient accuracy to give a reasonably fair test that would exclude or relegate to their proper place some of the poorer grades.

In many other lines enlightened advertising and selling policies have been employed to acquaint consumers with the real merits of the products they buy. Far too little has been done in this direction by oil producers with the result that the public as well as the engineer who knows more or less about lubricants distrusts the vendor. Unfortunately purchase by brand rarely assures uniformity in the lubricant, while even very large wholesale purchasers are without means for making intelligent selection of brands in the first instance. The whole situation is one which demands study and intelligent education. We believe that such education should be furnished by motor vehicle manufacturers if it is not forthcoming from the oil producer. Whoever undertakes it conscientiously will, we believe, benefit thereby.

Enlightened Self-Interest

AN automobile plant would not consciously increase the cost of parts which it buys on the outside unless there were some distinct advantage to be gained. It naturally desires to get those parts as cheaply as is consistent with the quality desired. Yet a too rigorous inspection of unimportant parts of pieces, especially if suddenly enforced, may have just that effect. Intelligence as well as rule is essential to efficient inspection work.

A parts maker said the other day that one firm had rejected a number of the parts which he was supplying that would undoubtedly have been used had they been made in the firm's own shop. This parts

maker believes that the manufacturer often rejects purchased pieces because he feels that it costs him nothing. In the case of parts produced within the manufacturer's plant, however, the manufacturer realizes directly the loss involved. He loses just the same in dealing with outside firms, nevertheless, since these firms naturally take these things into account when quoting on the next order.

In the case under discussion the rejected pieces were not defective in any essential way. Many were rejected because of slight abrasions on unexposed surfaces. To produce them without these slight abrasions and similar unimportant defects would have cost nearly double the price quoted.

In the same way, lack of knowledge on the part of the design engineer regarding practice in related industries may cause increased costs.

Both of these situations indicate the benefits that might be derived from a closer co-operation between manufacturers and contributory industries. The question is not one of lowering inspection standards; that would be undesirable. It is, rather, a matter of understanding the interdependent nature of the units of modern industry and of utilizing more fully the possibilities of enlightened self-interest.

Relation of Roads to Vehicles

ONE of the speakers at the Highway Transport Session of the S. A. E. Summer meeting dwelt on the inter-relation between the character of the roads in any locality and the general demand for automotive vehicles. His reasoning was absolutely sound, but when he proceeded to illustrate the point made by a specific example he was rather unfortunate in his choice. He said that on the Pacific Coast, where the roads in general are quite excellent, the sales of automobiles during recent months had been fair, whereas in Iowa, the poor roads of which state were well known, the automobile business had been flat.

We presume that the statements as to business conditions in the two districts are based on reports of dealers and have no reason to doubt their correctness. But when the speaker ascribed the mildness of the slump on the Pacific Coast to the good roads and its severity in Iowa to the bad roads of that State, he certainly was not very logical. It is known that Iowa for a number of years has been the banner automobile State, and if we take a period of three or four years previous to Jan. 1 last, Iowa bought more automobiles in proportion to its population than almost any other State. The roads in Iowa were no better during that period than they are to-day. This would even seem to disprove the contention that good roads influence the sale of automobiles favorably, but it does not. The point is that good roads are only one of several factors affecting demand for vehicles.

The check to automobile sales in Iowa is not particularly hard to explain. According to the latest available statistics, the State had one automobile to every 5.5 of the population, an equipment with which it ought to be able to worry along for some time in case of a pinch. Now, this pinch arrived when corn dropped in price from $1.80 a bushel to 45 cents and other agricultural products almost in proportion. Corn is Iowa's chief product and this drop goes a long way toward explaining the stagnation in the automobile trade in that State.

Getting Right with the Public

IT has been particularly gratifying during the last few days to note the number of automotive manufacturing concerns that have adjusted prices to suit the temper of the possible buyers. It is high time that this price question was settled. For a long time it has been a point of discussion wherever you went. Up hill and down dale and in the parlor one heard that automobile prices had not been adjusted and "soon you can buy at a lot less money."

This topic of conversation became popular months ago, when other prices began falling. It gained volume when Ford made his first big cut. It has been an increasing topic of conversation and rumors since. Manufacturers ignored it; dealers were confused. Selling was more or less demoralized.

Now there is the gratifying movement on the part of the manufacturers to end this price discussion. Most manufacturers have cut their prices and those who have not are explaining in their advertising why they will not cut. If the manufacturers will justify their prices, end the demoralization and get busy on a settled program, there is no reason why the motor car business should not go forward with a rush.

Scavenging and Charge Dilution with Exhaust Gases

IN the early days of the gas engine considerable attention was given to the principle of complete scavenging, and many engines embodying this principle were built. The aim then was—as it is now to a certain extent—to get the greatest possible power from an engine of given cylinder dimensions, and it was obvious that if the compression chamber could be completely swept clear of spent gases, so that the cylinder contained nothing but fresh charge at the end of the suction stroke, an increase in power could be obtained. With no change in the compression ratio, the effective ratio of expansion was decreased and a lessening in fuel economy might be looked for.

Complete scavenging has never found any application in the automotive field, no doubt because the apparatus required is too heavy and cumbersome to make it practical. On the other hand, some designers have recently even resorted to the opposite practice of introducing into the combustion chamber more dead gas than naturally remains there from one stroke to another. This reversal in practice is largely due to a change in the character of fuel employed, our present fuel having a much greater tendency to detonate than the gasoline of the earlier days. It may also be ascribed to a greater appreciation of the value of an adequate compression pressure. An admixture of spent gases with the fresh charge tends to prevent detonation and thus permits of higher compression being used, with consequent gain in economy.

Ford Makes Second Slash in Prices

Before War Basis Now Within Reach

Chassis $12 Higher Than in 1917 —Truck at $495 Is $105 Cheaper

DETROIT, June 7—Another cut in prices was announced to-day by the Ford Motor Co. It is effective immediately. The reductions are not nearly as large as those last fall which started the automobile price decline, but they mark a considerable step toward bringing Ford models back to the levels which prevailed before the war. The cuts range from $15 on the stripped chassis to $50 on the coupe and truck. The following table shows the changes:

CARS	Old Price	New Price
Chassis	$360	$345
Roadster	395	370
Roadster, with electric starter	465	465
Touring	440	415
Touring, with electric starter	510	510
Sedan (starting system and demountable rims)	795	760
Coupe (starting system and demountable rims)	745	695
TRUCKS		
Chassis	545	495

The following statement was made in announcing the price cut:

"The big reductions last fall were made in anticipation of lower raw material costs of which we are now getting the benefit, and this fact, together with increased manufacturing efficiency and an unprecedented demand for Ford cars, particularly during the last three months, permitting maximum production, have made possible another price reduction immediately.

Sales at Highest Point

"Ford business in April and May was greater by 56,633 cars and trucks than for the same two months last year. In fact the demand was even greater than the supply, so that output has been limited, not by unfilled orders, but by manufacturing facilities. During May we produced 101,500 cars for sale in the United States alone, making it the biggest month in the history of our company and our factories and assembly plants now are working on a 4000 car daily schedule for June.

"The Fordson tractor still is being sold at less than the cost of production on account of the recent big price reduction and it is impossible therefore to make any other cut in the price.

The announcement also was made that the wages of Ford workmen will not be reduced as the result of the price cut.

While the latest Ford cut was not so unexpected as that made last fall, other manufacturers had not expected price readjustments for a month or two yet.

In supplementing the statement in connection with the price cuts and denying reports that the plant will close, Henry Ford said:

"It has been the custom of the plant to release men during harvest time so grain could be cared for, but since there is an abundance of farm hands this year, this will not be necessary."

Ford said the plant was running far behind orders and that he expected to keep up the present production schedules indefinitely.

The Ford Motor Co. of Canada has announced a price cut of $65 on open cars and roadsters and $110 on closed cars. This makes the price of the touring car, without starter, $710.

TABLE SHOWING RANGE OF PRICES ON FORD

	Aug. 1 1917	Sept. 21 1917	Oct. 16 1917	Feb. 25 1918	Aug. 16 1918	Mar. 4 1920	Sept. 21 1920	June 7 1921
Touring	360	365	365	450	525	575	440	415
Roadster	345	350	350	435	500	550	395	370
Chassis	333	338	338	400	475	525	360	345
Coupelet	505	510	560	560	650	...	...	...
Coupe	...	...	...	...	...	*850	*745	695
Town Car	595	600	640	640	...	...	...	...
Sedan	645	650	695	695	775	*975	*795	760
Truck	600	600	600	600	550	600	545	495

*Includes starter and demountable rims.

Paige Reduces Prices on Complete Line

DETROIT, June 7—Price reductions were announced to-day by the Paige-Detroit Motor Car Co. They have been expected for several days. The reductions range from $20 to $160. The following table shows the new and old prices on the various models:

	Old Price	New Price
Glenbrook touring car	$1795	$1635
Ardmore Sport	2015	1925
Lenox Roadster, 2 passenger	1795	1635
Four passenger Coupe	2600	2450
Sedan	2720	2570
Lakewood, 7 passenger touring	2895	2875
Larchmont Sport	2995	2975
Five passenger Coupe	3775	3755
Seven passenger Sedan	3850	3820
Limousine	4050	4030

Price Changes Continued on Page 1233

Price Fluctuations Hold May Sales Low

Buying in New York District Spasmodic During Changes —Dealers Prosperous

NEW YORK, June 4—The automobile market in the Metropolitan territory is feeling keenly the swift succession of price reductions and sales are below standard on practically all lines, even including some of those which cut a month ago. With each succeeding reduction, the distributor handling the car reduced has a spurt of sales lasting a week or two, when somebody else comes along with a reduction and gets the attention of the public and some of its money, for the time being.

As a result of these reductions, sales for May, when they are fully compiled, apparently will show a smaller total than for April. One well known line sold a few less than half as many cars in May as in April and a good many others, except those which have benefited by heavy reductions, have had similar experiences.

Sales Surpass Former Years

However, the majority of distributors are making money. One large house which had May sales running something like 50 per cent of those of April, still made a profit in May, which the distributor declared "would have tickled me to death five years ago." He made a point that profits of the past two years are being continually used as a basis of comparison by dealers who are having about as much trouble as business in general in getting back to normal.

The Row presents a striking, if not an attractive, appearance, with a large number of salesrooms bearing flaring cloth signs announcing price reductions.

The used car situation is rather chaotic because of frequent reductions made necessary by reductions in new car prices, but the demand is fully as good as for new cars.

Caution Marks June Factory Plans

Parts Makers Find Trade Outlook Poor

Price Revisions Keep Cars Moving—Five Companies to Increase Output

NEW YORK, June 7—A large part of the automotive industry is starting June with no very definite idea of its destination. On the surface, at least, conditions are more uncertain than they have been at any time since January. Forecasts of production for the month are extremely hazardous.

Manufacturers of parts and accessories, whose plants have been operating for two months on an approximate 50 per cent basis, have less business booked for June than for any month since February. Many releases which were given in May for this month have been countermanded and there are few reports of new business.

It is difficult to reconcile this authoritative statement of conditions among the parts manufacturers with largely increased sales in passenger car lines which have made substantial price cuts. The companies which have made price readjustments assert without exception that largely increased sales followed their announcements and investigation shows there is no reason to doubt the truth of this statement.

Since retail sales of automobiles are increasing while the business of parts manufacturers is at a standstill, the only explanation is that most companies had accumulated a considerable surplus of cars which must be liquidated before production is resumed on the scale which prevailed in April and May. There is every indication, on the other hand, that retail sales for June will equal or exceed those of May, which averaged probably 25 per cent less than for April. Reports to the National Automobile Chamber of Commerce showed a gain for May of 13 per cent over April.

July Shutdown Unlikely

Detroit is pessimistic over the outlook for the immediate future, but it is not at all unlikely manufacturers there will be more cheerful before the close of the month. There is much talk in Michigan of a general shut down in the industry July 1, but unless retail sales conditions become much worse than they are now as June progresses, there is little probability of such drastic action being taken. At the present rate of sales in most lines the present surplus soon will be absorbed and factory operations then will be expanded.

Analysis of the situation does not indicate that it is as black as it is painted in Detroit. Nearly all the large production companies have taken their stand on prices and the situation in this respect is more stable than it has been in some time. Prospective buyers can go into the market with a reasonable certainty that there will be no more cuts for several months to come in the lines which have announced their attitude.

NEXT NEW YORK SHOW AT MADISON SQUARE

NEW YORK, June 3—The members of the National Automobile Chamber of Commerce at their annual meeting here yesterday decided to hold the next New York Automobile Show in Madison Square Garden because the Grand Central Palace is no longer available for such expositions. Arrangements will be made whereby there will be space at the Garden for exhibits by all members.

It was the unanimous belief that every effort should be exerted to make the show next January one of the most successful ever held. One of the leading factors in the selection of the Garden was its central location, making it more readily accessible in this respect, which is more desirable than the Palace.

The Chicago show will be held in the Coliseum as usual.

Ford Leads Factories in Schedules for June

DETROIT, June 6—Definite production schedules for June have been fixed by only seven automobile factories in Michigan and in only five of these are increases planned over May output. Ford is going over 100,000 for June while Lincoln, which built 425 in May, will cut to 400 this month. Both Cadillac and Packard announce increased June schedules, while Chevrolet will step up about 1400 if the schedule is maintained, and Studebaker approximately 1000. June estimates in those plants are 4400 and 8335 respectively. Packard plans to build 1000 single sixes and Cadillac announces 1600 against 1400 in May.

Dodge Brothers officials declined to say what schedule would be maintained as to working days beyond the statement that they expected to continue on an uninterrupted daily schedule hereafter.

All executives are disposed to move cautiously as regards production, and it is evident, save in those factories announcing definite schedules that the out-

(*Continued on page* 1232)

Price Cooperation Promised by Makers

Recognize Need for Quick Stabilization of Market—To Study Truck Dumping

NEW YORK, June 3—Real appreciation of the need of immediate action on whatever price adjustments are to be made was displayed by the members of the National Automobile Chamber of Commerce at their annual meeting here yesterday. It was felt that price changes might better have been made two months earlier or two months later but since they have been begun, manufacturers owe it to their dealers and to the public to take a definite stand which will aid in stabilizing the situation. Desire of bankers for further liquidation was blamed in some quarters for precipitation of readjustments in the automotive field which has been more prosperous than almost any line for the past four months.

The N. A. C. C. received a telegram from Harry G. Moock, general manager of the National Automobile Dealers' Association, urging on behalf of the dealers that car makers decide at once whether or not they intend to change their prices. A reply was sent stating that the N. A. C. C. was in entire accord with this view of the situation and felt the warmest sympathy for the dealers in the difficulties they are having to face.

Reports on retail business conditions in all sections of the country were submitted to the members. They showed that there was a decline in sales in May over April i almost every district except the South, where there was some improvement for the first time in many months. The best showing was made by lines which had reduced prices.

Expect Drop in June

It was the general opinion that June business would not equal that of May but that it would be of substantial proportions and that there was no occasion for pessimism.

Little change was reported in the commercial vehicle division of the industry. A few companies are doing a good business and some others have slightly increased their production. Reports are coming from dealers with increasing frequency, especially in the Metropolitan district, that they are finding great difficulty in competing with persons selling American made trucks of high grade reimported from England and France. Service on these vehicles is guaranteed and they are put on the market for 50 per cent of their list price. The Fiat

(*Continued on page* 1232)

Durant Speeds Up Production Plans

Experimental "Four" to Sell Under $900 Pleases Engineers—To Have Four Lines

NEW YORK, June 7—Important announcements by W. C. Durant regarding the future of Durant Motors, Inc., are expected in the near future. They will relate not only to production and personnel but to finances.

Plans for production are rapidly taking form. The experimental Durant cars have been completed and are satisfactory to the engineers in every respect. The "Four," which will sell for less than $900, is reported by those who have seen it to be a high grade job. It has many refinements not found ordinarily in low priced cars.

Provision now has been made for three lines. One of them will be the Durant, another the Collins, which will be produced in the old Cadillac factory in Detroit, and the third the Sheridan. A fourth line will be added, it is understood. Durant promised the people of Flint, Mich., in January, that one of his plants would be located in that city. He will keep his word in this respect and it is expected the fourth division of his company will be located there. Chassis models will be limited under the present plans, but there will be several body models. The Sheridan will be converted into a six-cylinder job and the Collins will be an eight.

Preliminary steps for the building up of a dealer organization now are being taken and it is understood several contracts already have been signed. It probably will be the policy of Durant Motors, Inc., to have its dealers handle all the affiliated lines. In this respect its program will differ from that of General Motors.

Michigan Gives Approval to Durant Stock Sale

DETROIT, June 6—Stock of Durant Motors, Inc., has been admitted to the Detroit Stock Exchange following approval by the Michigan Securities Commission and authorization for sale of 200,000 shares of common. Authorization was for sale at a price to be governed by market quotations and the stock now is listed on the exchange at 22 7/8. The company, under the commission order, is allowed to sell stock for cash or upon reliable payment plan on application to commission.

The officers are W. C. Durant, president; Carroll Downes, vice-president; Harry F. Hebermann, secretary, and W. W. Murphy, treasurer. These with E. Healy of New York compose the directorate of the company, incorporated under Delaware laws with offices in New York and Flint, Mich. The stock issue is asked to secure working capital and the declaration recites that the business of the company will be to manufacture automobiles, trucks, parts and accessories, and to hold securities of allied and affiliated companies. In the application for listing on the exchange, the company declares it has authorized 1,000,000 shares of no par value common stock of which 507,057 shares were outstanding May 1.

Poertner Gets Durant in New York Territory

NEW YORK, June 6—The Poertner Motor Car Co., distributor in the New York territory of the National and Scripps-Booth, has been appointed distributor in the Metropolitan area for Durant Motors, Inc. Poertner, who is one of the veterans in the automobile business, has had the National Scripps-Booth for several years, his territory including New York City and parts of New Jersey and Connecticut. He was formerly president of the New York Automobile Dealers Association.

It is learned that the Durant will probably sell for $890. It will have a four cylinder overhead valve engine and will be particularly well appointed, it is said, for a car of its price. At the start there will be three models, touring car, sedan and coupé.

G. M. Truck Resumes on Full Time Schedule

DETROIT, June 6—All departments of the General Motors Truck Co. resumed operations to-day and a full time schedule will be maintained indefinitely, according to W. L. Day, general manager. The fact that the machine shop and assembly department were down last week gave rise to a report that the plant would be closed entirely.

"We got ahead a bit on production, but the report that we closed down or would close was wrong," said Day. "We held up work in the machine shop and assembly for a week, but other departments were going right along and the plant opened in all departments to-day."

Day said the company had been having good business throughout the spring until the middle of May when there was a noticeable slump. This, however, he declared, he thought would be only temporary and looked for a gradual increase during the summer.

AMERICAN BUSHING SPEEDS UP

DETROIT, June 6—The American Bushing Corp. of Marysville, Mich., which is manufacturing bushings for the American and Canadian Ford companies, has increased production to 20,000 daily. Important changes in production methods devised by President J. W. Leighton permit the production increase.

MINNEAPOLIS S. A. E. ELECTS

MINNEAPOLIS, June 6—The Minneapolis section of the S. A. E. has elected officers as follows: President, W. G. Clark; vice-president, C. E. Moody; secretary, C. T. Stevens; treasurer, J. S. Clapper.

Cleveland Industry Shows Further Gain

Increased Employment 3.6 Per Cent in May—Other Businesses Report Additions

CLEVELAND, June 3—The automobile industry in Cleveland continued on the up-grade during the month of May according to a survey made by the Committee on Labor Relations of the Cleveland Chamber of Commerce for the U. S. Department of Labor.

The twelve companies in the automobile industry in this city were surveyed and the number of employees on the payrolls of the companies May 30 was 3.6 per cent greater than the record for April 30. On April 30 these companies employed 9949 persons, while on May 30 the number had increased to 10,310.

These reports have been issued by the Committee on Labor Relations since the first of the year and the automobile industry sets the pace for all other industries in the matter of recovery. The report discloses that general conditions in Cleveland are improving for ninety-nine establishments that were surveyed had increased the number of employees May 30 over April 30 1.8 per cent. The total number of employees on May 30 was 62,956 as compared to 61,847 a month ago.

The building trades workers have been on a strike here for a month and there was a decrease of 43.8 per cent in the number of employees in this industry in the last month. Metal products other than iron and steel made a big advance toward normal conditions in the last month with an increase of 14.1 per cent in the number of employees. The automobile industry is held responsible largely for this increase.

The other increases reported are as follows: Food and kindred products, 7 per cent; textiles and their products, 5.2 per cent; iron and steel and their products, 4.6 per cent; paper and printing, 5.8 per cent; chemicals and allied products, 2.7 per cent.

COURT ORDERS JOHNSON SALE

INDIANAPOLIS, June 3—Authority was given recently by the St. Joseph Superior Court for the sale of the Johnson Motor Wheel Co. of South Bend, Ind. Following financial difficulties the company was placed in the hands of a receiver. The company conducted a stock selling campaign a short time ago and hundreds of persons in the northern part of the State invested their savings.

KNOX PROPERTY REVERTS

SPRINGFIELD, MASS., June 4—Knox Motors property which has been occupied by the Sinclair Motors Co. has reverted to the Knox Motors interests under a mortgagee's sale of the real estate. The property was bid in for $250,000 by H. G. Fisk, president of Knox Motors.

Toledo Factories Increase Schedules

Overland to Double Production in June—Parts Plants Gain Steadily

TOLEDO, June 6—A substantial improvement in the automobile industry is shown in the announcement of June schedules by several factories here.

Willys-Overland output this month will be more than doubled, with enough orders already received to take up the whole month's production. The notice was sent out Saturday that no closed car models could be delivered now before June 20. The price cut has greatly stimulated the business.

The production of automobile equipment at the plant of the Electric Auto-Lite Corp. will be increased by 20 per cent in June, Clement O. Miniger, president, announced. The May production at the plant was 20 per cent greater than in April. There are now 1027 employees at the Auto-Lite plant, which compares favorably with a normal force of about 3000.

President Miniger says that orders received during the last week from many companies which have cut prices on their cars shows that the lowering costs are stimulating business beyond the expectations of the manufacturers. He doesn't expect the usual summer sag to come this year at all.

George D. Moore, general manager of the Toledo Chevrolet plant, said that nearly 200 employees had been brought back into the plant here in the last week and that the force is to be doubled this week. This is largely on the strength of the increased volume of business which Chevrolet distributors have noticed since the announcement of price reductions.

The Chevrolet company manufactures only differentials and transmissions here. The company has had a large stock of these parts on hand in various of its assembling plants and in the hands of agents so that necessarily the local plant has not been speeded up as much as the actual production would indicate.

There were nearly 1200 employees at work in the Chevrolet plant here in the peak periods.

Daily Driveaways 100 to 150

The daily drive-aways of 100 to 150 cars from the Overland plant has recalled to many of the employees the prewar days. There are also many carloads leaving the city by rail every day to more distant points of distribution. Several boatloads have gone to Buffalo in the last few weeks for the eastern States' demands.

The June production is to be at its maximum speed by June 10, according to Vice-President Charles B. Wilson, at the plant here. He says the actual output of cars for June is to be 112 per cent over the number produced in May. The plant payroll will be increased by about one-third so that there will be 8500 employees at work the last week in June.

One of the most difficult problems for the factory to face at the present time is the task of getting the materials delivered here in time to keep up with production. Supplies have been coming so slowly for several months that in many cases it is difficult to get the necessary speed up in short notice.

The factory has also gone into full time operation. For several weeks it has been on a four-day week basis, but now the output of every man every day is needed to keep up with the orders. The employment office here has indicated that practically every old Overland employee who could be located has been recalled into the service of the company and that from now on the positions will be open for new men.

Northway Pushes Sales in Eastern Territory

BOSTON, June 4—Northway Motors Sales Co. has launched an active truck merchandising campaign in the territory covered by its thirteen factory branches in New England and Middle Atlantic States. Fifty new salesmen have been placed in the field who will operate under the new sales organization headed by Joseph Husson, general sales and advertising manager, formerly editor of The Commercial Vehicle. His associates are W. E. Downs, assistant sales manager; H. F. Flugge, general service manager; F. L. Ortla, assistant service manager; R. B. Sill, branch sales manager; H. W. Pierce, manager of dealer sales, and Richard A. Magee, who is in direct charge of advertising.

Springfield Body Adds Unit to Meet New Sales

SPRINGFIELD, MASS., June 3—Plant capacity of the Smith-Springfield Body Co. is to be increased 50 per cent and 100 additional men are to be employed. Construction of a new unit, 90 x 320 ft., was begun four weeks ago and will be completed June 15. Completion of this building will double the size of the plant.

The company has recently obtained contracts for closed-car construction from the Wills Sainte-Claire and Mercedes companies. It has been making closed and touring type bodies for Rolls-Royce of America, Inc., Stevens Duryea, Marmon, Lincoln and the Citroen company.

TEXAS BUSINESS IMPROVED

DETROIT, June 6—Walter Zimmermann, special representative of Olds Motor Works, Lansing, has returned from an extended trip to the cotton states with the report that business conditions are greatly improved in some sections of the South. This is true particularly in Texas, Zimmermann said. With more stable government in Mexico that country is beginning to buy in Texas and cotton growers are optimistic.

Oakland Officials Resign Positions

Masten, Young and Hamilton Leave and May Join Durant —Other Changes

DETROIT, June 4—Changes in personnel have been coming with increasing frequency within the last two or three days, prominent among which was the departure of W. H. Masten and J. W. Young, assistants to the general manager of the Oakland Motor Car Co. and A. G. Hamilton, chief engineer, whose resignations became effective May 31. No successors have been named to Masten's or Young's positions by General Manager G. H. Hannum, but Benjamin Jerome, formerly assistant to Hamilton, succeeds to the position of chief engineer.

Masten had been with Oakland a long time and was regarded as one of the leading figures in the organization. No information regarding the plans of any of the three officials could be ascertained, though persistent reports are that they will join W. C. Durant, R. H. Collins and Edward Ver Linden in the new Durant organization.

Announcement of resignations of Frank G. Eastman, advertising manager of the Lincoln Motor Co. and H. S. Dart, advertising manager of the Paige Motor Car Co., both of which became effective within the last two days created much surprise in local automotive circles. Dart and Eastman were regarded as firmly entrenched and were considered among the leaders in that branch of the business. Their resignation came suddenly, and no information regarding the details could be secured either from factory officials or from Dart or Eastman.

Dart will be succeeded by W. K. Towers, at present advertising manager of the Reo Motor Car Co. Towers will assume his duties with Paige June 13, but no successor to Towers has been named by Reo. Dart has several connections under contemplation but is not yet ready to make an announcement. Officials of the Lincoln Motor Co. have announced no successor to Eastman and the latter has made no future plans.

H. M. Chadwick, formerly sales manager of the Insulating Materials Co. of Detroit, and prior to that with the Packard Motor Car Co. has taken over the sales and advertising end of the Michigan Crown Fender Co. products. The Crown Fender factory is located at Ypsilanti and manufactures fenders and other automobile parts.

IMMEL STOCKHOLDERS TO BID

COLUMBUS, June 6—While no definite date for the sale of the plant and other assets of the Immel Co. has been set it is announced it will be within the next 40 days. Receiver R. H. Schryver has been authorized by the court to sell the plant and all of the assets. A committee of preferred stockholders is being organized to bid on the plant.

Buying Power Large Says Reserve Head

Financial Situation Reaches New Strength—Anxious to Aid Legitimate Business

NEW YORK, June 3—"The emergency of 1920 has definitely passed," said W. P. G. Harding, Governor of the Federal Reserve System, speaking before the annual meeting of the National Automobile Chamber of Commerce yesterday. "There is nothing as far as the financial condition of the country is concerned as affected by the Federal Reserve Banks that causes any other feeling than one of optimism."

Availability of credit, the fact that automobile shipments for the past two months equalled 67 per cent of the same months of last year, the feeling that prices have reached a new stable level, and Governor Harding's statement that "the public has a great deal of buying power left" were major points of the meeting.

Governor Harding pointed out that the financial situation of the Federal Reserve system is stronger than at any time since the third Liberty Loan and that the banks are anxious to lend to legitimate business.

"We want to get the public out of the idea that things are constantly going lower and lower and lower," said Governor Harding, "and we should get some stability into the situation." It was the opinion at the meeting that the new low price levels now reached would probably be stabilized on the present basis as almost all the motor companies have readjusted their prices. The consensus of opinion brought out that motor car and truck companies have anticipated the lower levels of raw materials and have priced their product on the new basis.

Cars Keep Steel Moving

"The public has a great deal of buying power left," said Governor Harding, "and buying power begets buying power. You start up one industry and you automatically start up another. It is amazing when you consider the automobile industry to find how many things are dependent upon its prosperity. It affects the purchases of steel and all the processes of steel manufacture. See how much employment that gives to labor."

The automobile market is a leader in return of buying, reports at the meeting brought out. The May shipments exceeded April by 13 per cent and April and May shipments were 67 per cent of the same months of last year, comparing favorably with the steel market, with pig iron which is on a 50 per cent basis, and with rail transportation which is on a 60 per cent basis.

"The Federal Reserve Banks," said Governor Harding, "which are the ultimate resource of all member banks, and through them, of the public are in a position now better than ever before to extend to all legitimate business all assistance needed and are not only in position to do that but are anxious for business to avail itself of it.

"The Federal Reserve System has no desire other than to be a help to business, and all paper which is eligible under the Federal Reserve Act—that is notes, drafts and bills of exchange issued or drawn for commercial, agricultural or industrial purposes—is eligible for rediscount at any Federal Reserve Bank upon the endorsement of a member bank. There are no discriminations in the Federal Reserve System against any class of paper which is eligible and all applications for rediscount will be considered in a businesslike way upon their merits."

Central Ohio Finds Sales Outlook Better

COLUMBUS, June 6—With more price reductions announced and a better feeling developing in industrial circles, the sale of automobiles in Columbus and central Ohio territory is gradually increasing. This is the statement of practically all of the Columbus agents and also from some in the territory immediately surrounding the Buckeye Capital. The passenger car business is especially stronger, although some increase in demand is reported for commercial vehicles.

Farming communities are showing an increase in the demand for passenger cars. This is seen in the corn raising sections when the crops are now planted and farmers have a little time to look around. There are excellent prospects for a big wheat crop and this has the effect of stimulating sales of cars. In the farming sections there is also an increase in the demand for trucks and small tractors.

TIMBER SUPPLY PLENTIFUL

DETROIT, June 6—Emil Brock of Weis-Lesh Mfg. Co. of Memphis, Tenn., logging and spoke manufacturing unit of the Motor Wheel Corp., declares there is a timber supply sufficient for the next 50 years under control of his organization. Brock has been in Lansing for a conference with H. F. Harper, general manager of the Wheel Corp., and other officials. He said the Memphis unit has a large supply of raw material for shipment to the wheel plant in Lansing. The mills, however, are running on a curtailed production schedule.

MUTUAL INSURANCE URGED

NEW YORK, June 3—Increases in automobile insurance rates during the past few months have again directed the attention of automobile manufacturers and dealers to the need for a mutual insurance company to care for motor cars and motor trucks, similar to the one launched four years ago. It is asserted by the National Automobile Chamber of Commerce that loose methods of accepting risks without due regard to the moral hazard and excessive overhead expenses have resulted in the imposition of rates from which the only relief lies in mutual companies.

Harding Visit Stirs Kansas City Action

Dealers Line Up Sources of Credit —Southwest Nearing Normal Buying Move

KANSAS CITY, June 6—The visit of Governor Harding of the Federal Reserve Board, and the announcement of relaxation of restrictions as to rediscounting, which followed that visit, are beginning to show results in Kansas City territory. The immediate results are rather the sifting out of bankers, than the promotion of motor car sales.

Motor car dealers are no longer put off with the defense against loans, that the Federal Reserve will not rediscount the paper. Since the bankers have to give the real reasons for refusal, the motor car dealers are better able to judge what their next step should be. In some cases, this step is the finding of another banker. The motor car dealer who has his books in good shape, whatever they show, can confidently visit another banker and talk with him.

It is evident that many banks have not reached the satisfactory condition in relation of loans to reserves, of the Federal Reserve Banks. It is said that the country banks are less able to extend credit facilities than some of the larger city banks—the liquidation of the past few months being heavier with the city banks, whereas the country banker still has to carry agricultural loans. But the activity of the motor car dealers in ascertaining facts, is equalizing the service, so that the banks that can extend facilities will have opportunity to do so.

Perhaps the most important result of the visit of Governor Harding has been in the stiffening of the morale of the dealer. He now has the courage of his industry. Gradually this brighter tone is being infused into the territory, into bankers, and business men, as well as into the dealers themselves.

Trade Trip Dispels Gloom

Another incident that has helped mightily to bolster the optimism of Kansas Citians is the trade trip of the Chamber of Commerce through Kansas, Oklahoma, Texas, Arkansas and Missouri. The hundred Kansas Citians started on the trip dubiously, fearing to be deadly depressed by the sad condition of the Southwest and the lugubriousness of its business men. But they found that the Southwest is recovering.

"There is business in the Southwest waiting for us to go after it," said one of the men who made the trip. "The trouble with us is that we have listened to the gloomy stories of our travelers who have been convinced by the refusal of merchants to 'buy now,' and who have assumed that the merchants were never going to buy. The Southwest is past the turn, and is going strong. Stocks are reduced and merchants will be in the market close to normal very soon.

Commonwealth Sells Car Finance Business

Commercial Investment Trust Takes Over Clientele and Paper Now on Books

NEW YORK, June 7—The Commercial Investment Trust, 347 Madison Avenue, New York City, has acquired the automobile business of the Commonwealth Finance Corp. Under the arrangement the C. I. T. has taken over automobile paper on the books of the Commonwealth. In addition to acquiring business already on the books, the C. I. T. will continue to serve Commonwealth clients. Samuel S. Mattison, former sales manager of Commonwealth, has accepted a similar position with the C. I. T. and will have with him as district managers, B. J. Hall, Baltimore territory; W. W. Thomas, Buffalo territory; Elmer P. Yost, Pittsburgh territory; J. E. Parker, Philadelphia territory; W. H. Billings, Boston territory, and W. A. Gilroy and M. R. Sanborne in the New York and New Jersey territory. The Commonwealth company will transfer its activities to other fields in which its broad charter permits it to operate. It already has taken up real estate and mortgages, not so much in the metropolitan district as in other places. Its plans in this direction have not been definitely worked out.

The assets of the corporation have been transferred from the original South Dakota corporation to a new corporation formed in Delaware. This action was approved, it is stated, by approximately 90 per cent of the stockholders. The litigation which has kept the affairs of the corporation in the courts for the past two years has been settled and all the suits have been withdrawn. It is understood as a preliminary to discontinuance of the suits a substantial sum was paid to Ormsby McHarg and his associates by Henry D. Tudor, president of the company, and the faction which has stood with him in the controversy.

Tudor and his friends never lost control of the affairs of the Commonwealth and the receivers appointed both in South Dakota and in New York never obtained possession of the assets. They were successfully barred out by a series of restraining orders.

TIRE SERVICE CHARGE URGED

NEW YORK, June 4—The executive committee of the tire manufacturers division of the Rubber Association of America has recommended to all members that a service charge based upon a percentage of the invoice cost of the returned goods, plus return freight charges, be charged all purchasers who return tires and accessories to manufacturers for repairs. This custom on the part of motor car owners has given rise to many difficulties and it has been deemed advisable to handle the business in a uniform way.

The publicity department of the Rubber Association will devote considerable attention to educational work covering load carrying capacities of pneumatic truck tires. The attention of truck manufacturers and users will be called to the fact that the load carrying capacities specified in the schedule of maximum loads are the actual maximums and that in respect to overloading, consideration should be given to the necessity for a factor of safety by the use of larger equipment.

Would Liquidate Stocks Stored in South America

NEW YORK, June 4—Proposals for the formation of a co-operative liquidating corporation to handle all excess stocks of American merchandise unclaimed in the customs houses of South America were made to-day at a joint meeting of the Argentine-American Chamber of Commerce, Brazilian-American Chamber of Commerce, American Manufacturers' Export Association and the Pan-American Advertisers Association. The meeting was attended principally by local export managers and considered the liquidation of all classes of goods without reference to automotive lines. Estimates placed the value of these unclaimed goods at Buenos Aires as $25,000,000.

Reports from various cities in Latin-America recently received indicate that liquidation is proceeding on all automotive products and consequently there is some doubt as to the part the industry might take in the proposed corporation. Its purpose would be to clear all unclaimed goods through the customs houses so that storage penalties would not accrue, and so that they would not be auctioned off for charges. The corporation then would endeavor to market the goods in the various countries, endeavoring to do so to the best interest of all business.

The proposals were made by Max W. Boley of Buenos Aires, who was the delegate of the Chamber of Commerce of the United States in the Argentine, and J. W. Finch, an exporter to Brazil and Argentina. The plan will be studied by a committee composed of two members from each of the organizations participating in the meeting.

DECLARE PRACTICES UNFAIR

NEW YORK, June 6—The National Vigilance Committee of the Associated Advertising Clubs of the World has sent out a statement warning against what are characterized as unfair practices of the Franklin Tire & Rubber Co., 34 West Lake St., Chicago. It is asserted that this company, which originally called itself the Racine Tire & Rubber Co. of Chicago, solicited dealers to handle tires called "Racine quality tires." Dealers confused the Chicago company with the Racine Rubber Co. of Racine, Wis., makers of standard tires. Use of the word Racine finally was discontinued by the Franklin Co. They now offer, howver, "special racing tires."

Horsemen Belittle Tractor-Horse Test

Declare Demonstration Purely to Focus Attention on Tractors —Sanction Withheld

CHICAGO, June 6—The Horse Association of America has issued a statement asserting that it has not sanctioned the demonstration by tractors and horses in field operations which has been arranged by the National Implement & Vehicle Association. The first of these tests will be held at Fargo, N. D., June 28 to 30. The statement says use of the name of the Horse Association of America in telling of the proposed contests was unauthorized. The plan is characterized as "purely one by the tractor interests calculated to focus attention upon their national demonstrations. No horsemen have been consulted in respect to the demonstration or rules." The statement says:

"The situation is this: Tractor sales have fallen away to practically nothing, due to awakening consciousness on the part of the farmers that horses and mules furnish the most reliable, efficient and economical power on the farm, when farm profits over a period of years are taken as the test. In a desperate effort to do something to stimulate tractor sales, a group of men in charge of this particular problem have hit upon this plan in the hope that such a demonstration would show that more can be done in a few hours with tractors than with horses and thus create sentiment favorable to tractor sales."

Select Dakota Site for Tractor Trials

FARGO N. D., June 6—The Haggert 640-acre farm on the Red River road six miles west of here has been selected for the truck, roadmaking and ditching demonstrations to be made June 28-30 under the auspices of the National Tractor Farming Demonstration and Show. Chairman J. B. Bartholomew of Peoria, Ill., announces horse show in connection. E. E. Whaley is general manager. Each tractor or horse-drawn outfit will be assigned a definite section in which to work, based on the number of bottoms. The horse outfits will be in competition only with each other. Trucks will start from various points to reach the farm overland in time for the contest. They will be judged on their records to the finish.

BODY BUILDERS MEET JUNE 16

NEW YORK, June 6—A special mid-year convention of the Automobile Body Builders' Association will be held at Detroit, June 16 and 17, "to consider ways and means of overcoming the difficulties confronting the industry." Attendance will not be limited to members of the association but will be open to all manufacturers of automobile bodies.

Price Cooperation Promised by Makers

Recognize Need for Quick Stabilization of Market—To Study Truck Dumping

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company also is making a strong bid for business with its trucks.

The truck manufacturers discussed seriously the question of what could be done to make less serious the competition of reimported trucks. Some of them felt that if Congress enacted a permanent anti-dumping law which would cover the situation it would result in retaliatory action, especially by England and France, which would interfere with American sales in those countries. Others took the position that there was little probability of business with these countries for a long time to come under even the most favorable conditions.

No action on the subject was taken by the truck committee but it was decided to investigate the subject further and it was deemed advisable to attempt to have a clause inserted in the permanent tariff bill which would protect the industry from this competition.

The unit parts service question was discussed at the afternoon session. The viewpoint of parts manufacturers who have established chains of stations at which their products can be purchased was presented by E. H. Broadwell, president of the Motor and Accessory Manufacturers' Association. M. L. Pulcher, vice-president and general manager of the Federal Motor Truck Co., represented the manufacturers of assembled trucks and strongly opposed the parts makers' service plan. The dealers were not represented in the discussion and no vote was taken. There was evident a wide difference of opinion on the part of the members of the N. A. C. C. Broadwell declared the manufacturers he represented would do whatever was best for the industry.

Have Time Now for Service

One section of the manufacturers contends that conditions are different now than they were a year or two ago when owners of motor vehicles were clamoring for parts and the dealers were so busy selling cars and trucks that they paid little attention to their servicing. The situation now has changed radically and everyone is out fighting for business. It is easy to get men and materials. It was felt that a general discussion of the question would be helpful and lead to great reforms in respect to overcharges.

The tax committee reported the action it had taken at Washington in appearing before the Senate Finance Committee in opposition to the "stigma taxes" imposed on the industry. Activity on the tax question will be continued. Everyone interested is expected to make his position plain to his representatives in Congress.

A general meeting of all the interests advocating the passage of the Townsend highway bill was held Wednesday night and a program was outlined for work in advocacy of this measure. At the meeting were representatives of the N. A. C. C. the M. A. M. A., the Rubber Association of America and the N. A. D. A. Chief opposition to the Townsend bill comes from the American Federation of Farm Bureaus.

Officers and Directors Re-elected by N.A.C.C.

NEW YORK, June 3—Members of the National Automobile Chamber of Commerce at their annual meeting yesterday re-elected five directors whose terms had expired. They were: A. J. Brosseau, president of the International Motor Truck Corp., A. R. Erskine, president of the Studebaker Corp., Alvan Macauley, president of the Packard Motor Car Co., W. E. Metzger, vice-president of the Columbia Motors Co., and R. E. Olds, president Reo Motor Car Co.

At their reorganization meeting the directors re-elected the following officers: President, Charles Clifton, Pierce-Arrow Motor Car Co.; vice-president, Roy D. Chapin, Hudson Motor Car Co.; second vice-president, passenger car division, C. C. Hanch, H. C. S. Motor Car Co.; second vice-president, motor truck division, Windsor T. White, White Motor Co.; secretary, A. J. Brosseau; treasurer, H. H. Rice, Cadillac Motor Car Co.; general manager, Alfred Reeves.

Ford Leads Factories in Schedules for June

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put will be based wholly upon current sales demand. In spite of figures announced, a cereful check of all factories indicates that total production this month, exclusive of Ford, will not be more than 60 per cent of May figures.

Hupp now is building from 75 to 80 cars daily, but Hupp officials frankly admit that as soon as production equals current demand, the plant will slow up and perhaps close down temporarily until sales justify resumption. Buick officials express the hope of topping May production figures.

The Timken Detroit Axle Co. will close July 1 for one month and executives will take vacations simultaneously. Continental Motors is laying off men in its sales and other departments, indicating a general slowing up. The Liberty Starter Co. is cancelling deliveries.

PART TIME WORK GROWS

DETROIT, June 6—Employers' Association figures for the week ending May 31 show a decrease in the number of employees over the previous week of 3103 and an increase in employees working part time of 2371. Total employed was 113,456 against 116,564 the previous week. The figures are from 79 factories including practically all automobile plants.

Most Factories Take Position on Prices

N. A. D. A. Gets Replies from Fifty Manufacturers—Twenty-two Stand Pat

ST. LOUIS, June 4—Automobile manufacturers are pretty well agreed that the best way to stabilize the market is by a definite determination of price according to replies received by Harry G. Moock to his telegram May 31 to the manufacturers asking them to determine whether they were going to reduce, raise or stand pat and let the public know exactly what might be expected. Replies have been received from more than 50 manufacturers.

"I want to emphasize at this time," Moock said, "that my telegram of June 2 was not a request to manufacturers to reduce their prices. That's a matter that the factories only can determine, but the important thing which I sought to bring out in that request was that the public must be made to understand the situation. If a manufacturer is going to cut, let him cut now. If he is going to raise, let him raise. If he is going to stand pat, let him stand pat. But tell the public what you are going to do and stick to it, was the tenor of my message.

"Manufacturers who announced that they would maintain present prices are Haynes, Milburn, Rausch-Lang, Briscoe, Commonwealth, Cadillac, Maibohm, Daniels, Grant, Brewster, Pilot, Cox, Cunningham, Chandler, Detroit Electric, Apperson, R. and V. Knight, Dorris, Mercer, Locomobile, Crow-Elkhart and Auburn.

"From the following replies were received that just as soon as an announcement was practicable it would be made: Sayers, Roamer and Stutz."

TO MERGE FORD OHIO PLANTS

COLUMBUS, June 3—Information made public recently indicates that the Columbus assembling plant of the Ford Motor Co. will probably be discontinued when the new large assembling plant, planned at Hamilton, Ohio, is completed. The Hamilton plant will be started soon and will cost $400,000. It will have a capacity of 30,000 cars yearly. In the event that no changes are made in the plans both the Columbus and Cincinnati plants will be merged into the one at Hamilton.

W. C. SERAN UNDER CHARGES

BLOOMINGTON, ILL., June 6—W. C. Seran, president of the defunct Federal Auto Supply Co., has been charged with violation of the Illinois Securities Act in an information filed in court upon complaint of W. M. Conger, who invested $1000 in the firm. It is charged that the stock was not marked "speculative" and that other requirements of the act were not complied with by Seran. The company went into bankruptcy when a court judgment for $90,000 was secured.

MORE COMPANIES CUT PRICES

Drastic Price Cut Is Made by Dodge

$300 Slash on Open Models and More on Closed—Ads Withhold Figures

DETROIT, June 8—Dealers were notified to-day by Dodge Bros. factory officials that sharp reductions in prices would become effective immediately. It had been expected that some action on prices would be taken soon, but the cuts were deeper than dealers anticipated. Following are the old and new prices:

	Old Price	New Price
Touring car	$1285	$985
Roadster	1235	935
Coupe	1900	1585
Sedan	2150	1785
Screen side express wagon	1270	1085
Panel delivery wagon	1350	1135

The price of the touring car at the beginning of 1917 was $785, the coupe $950 and the sedan $1,185.

The decision to cut prices was not unanimously approved within the Dodge organization, and the widows of John and Horace Dodge are said to have cast the deciding vote in favor of the reduction. It is understood that price readjustment had been virtually agreed upon late in April, but the announcement was deferred more than a month.

Liberal space was used to-day by Dodge dealers throughout the country in advertising the price reductions, but in one respect the advertisements differed from those of other companies. No figures were given and the only way in which prospective purchasers could get the new prices was to communicate with the dealers. The underlying theory back of this plan appeared to be it would result in bringing more prospects into the salesroom and thereby increase sales.

DIXIE FLYER DOWN $150-$275

LOUISVILLE, KY., June 6—The Kentucky Wagon Mfg. Co., maker of the Dixie Flyer, announced price reductions ranging from $150 to $275 on its models. The touring car and roadster are reduced from $1595 to $1445, the coupé from $2570 to $2295 and the sedan from $2570 to $2345.

BREWSTER MAKES BIG CUT

NEW YORK, June 9—Brewster & Co., Long Island City, has reduced prices on the roadster and 5-passenger models to $7,000. The cars formerly were listed at $7,900 and $9,000 respectively. No change is made in the inclosed car prices.

Norwalk Motor Car Co., Inc., of Martinsburg, W. Va., makers of the Norwalk car, has reduced the price on its 5-passenger model from $1,285 to $1,135.

Raleigh Motors Corp., Bridgeton, N. J., has reduced prices on its 3 and 5-passenger models from $2,750 to $2,250; on the coupé from $3,600 to $3,100, and on the sedan from $3,700 to $3,200.

Birch Motor Cars, Chicago, has reduced prices on its roadster and 5-passenger models from $1,689 to $1,595.

British Factories Cut Prices to New Levels

LONDON, May 24 (by Mail)—Automobile trade in England is at a standstill. This applies to trucks as well as passenger cars, although it was expected that the miners' strike would give some impetus to sales of commercial vehicles.

Failure of this hope to materialize probably is due to the general slump in all lines of industry.

Prices on practically all British cars except Rolls-Royce and Napier have been substantially reduced and there is sharp competition for whatever business there is. With an improvement in exchange rates, American exporters will have an excellent opportunity to get a better grip than ever before on the British market.

Kissel Reduces $500 on Standard Models

HARTFORD, WIS., June 8—Price reductions of $500 have been made by the Kissel Motor Car Co. on the coupé and sedan of the Standard model line, bringing the new price to $3,775. The 7-passenger touring and the roadster remains at $2,775 and $2,975 respectively. No price change is made on the De Luxe line with regular equipment. The one-ton truck chassis is reduced from $2,175 to $1,585.

AMERICAN CUTS $200 TO $345

NEW YORK, June 9—Price reductions ranging from $200 to $345 have been made by the American Motors Corp., Plainfield, N. J., manufacturers of the American Balanced Six. The new prices are: Sedan $3150, 4-pass. sport $2350, 7-pass. touring $2275, 5-pass. touring $2195, roadster $2195. Former prices on each of these models were $3495, $2595, $2475, $2395, $2395. The new prices are guaranteed until Jan. 1, 1922.

COLUMBIA MAKES $350 CUT

DETROIT, June 9—Columbia Motor Car Co. has announced a price reduction on all models averaging $350. The new prices are to take effect at once.

CANADIAN FORD DIVIDEND

WINDSOR, ONT., June 8—The Ford Motor Co. of Canada has declared its regular annual dividend of 15 per cent.

Excise Tax to Stay, Washington Believes

Protests Considered Vain Unless Drastic Changes Are Made in Government Plans

WASHINGTON, June 3—Though the House Committee on Ways and Means has not taken up the question of internal tax revision, it is believed that the automobile industry will be accorded little relief from the present tax burden. The Senate Committee on Finance has closed hearings on the tax revision but has not indicated its opinion on the various proposals submitted by the automotive and other industries. The opinion prevails that the excess-profits tax will be abolished and possibly a 15 per cent tax on corporations substituted, the excise tax retained but not increased, for a year or two at least, the surtaxes lowered and certain minor taxes abolished because of the expense attached to their collection.

The views of the National Automobile Chamber of Commerce, the National Automobile Dealers' Association, Motor and Accessory Manufacturers' Association, and other automobile organizations which were presented to the Senate, will be submitted to the House Committee on Ways and Means at an early date as part of the Senate testimony. Nobody is willing to believe that the House committee will adopt proposals of the former Secretary of the Treasury that a horse-power and gasoline tax should be levied as additional source of revenue.

Unless drastic changes are made in the conduct of the Government, the excise tax will be retained, despite all protest, because it has, in the opinion of the Treasury, proven a reliable and satisfactory means of income. Frankly, Congress is particularly desirous of enacting revenue legislation which has no political boomerang.

The Senate has practically closed all hearings on internal revenue revision. There have been strong indications of their opposition to the sales tax plan and, in fact, it is generally believed that there is no hope for the sales tax at this session.

Tariff to Arouse Haggling

The introduction of the permanent tariff in the House probably will be a signal for almost interminable controversy. It could not be otherwise. It is the duty of the House Committee on Ways and Means to originate internal revenue measures, but it is doubtful if the committee can give its full time and consideration to these proposals for several weeks. If the permanent tariff is presented by June 15, practically every minute of the committee's time will be taken with defense and explanation of the schedules. The haggling over rates will not permit the tariff framers to devote time to tax hearings.

The Senate cannot take any action on the tariff until it passes the House.

Hoover to Arrange Statistics Service

Exchange of Information for Mutual Benefit Outlined at Committee Meeting

WASHINGTON, June 3—A tentative arrangement was made here to-day for the compilation of more comprehensive automotive production figures to be published for the information of other lines of business. Steps to this end were taken at a meeting of Secretary of Commerce Hoover with a committee representing the industry.

Secretary Hoover discussed quite frankly with the committee his object in asking that representative production figures be supplied to him monthly. He said that other industries had asked for these figures, representing to him that their business depended upon some knowledge of the number of vehicles produced. He added that the automotive industry had become such a power in the business world that other business needed to know something of its activities, just as the iron and steel and railroad figures were an index to activity.

J. Walter Drake, spokesman for the committee, discussed figures that would be helpful to the industry. He said that better crop figures were needed and that the industry could use to advantage more specific figures on steel, income taxes, railroad freight ton miles, railroad passenger miles, totals of business done by the textile, shoe and meat industries. He said that most of these figures were available too late to be of best use and that their sources were widely scattered.

In the conclusion, Drake proposed that the industry submit a written memorandum of the figures that could be supplied through the National Automobile Chamber of Commerce. He said he did not doubt but that monthly figures on factory sales (practically equal to production) could be supplied, separated into certain price classes. Secretary Hoover was quite positive that figures must be so separated to be of best use.

Seeks General Outline

Drake demurred at supplying figures indicating the activity as compared with capacity. He said that capacity was a doubtful proposition. Secretary Hoover made it very plain that he did not want figures that would in any way embarrass the industry, nor was he interested in the individual factory activity. He wanted only a picture of the industry as a whole. Secretary Hoover also said that he would work out a price classification of exports by prices as soon as the clerical labor could be arranged.

Drake will also submit a memorandum of what figures the industry wants. Secretary Hoover said these would be available in the near future, if they were as already outlined.

The Secretary asked that the industry recommend some person to be a representative of the industry on his staff. He wanted a broad gauge salesman with a statistical turn of mind. This person is to plan the information gathering campaign, both in this country and abroad and for a period will be on the Department of Commerce staff. Also he wanted suggestions for a man to serve as a connecting link between the Bureau of Standards and the industry. This man, he said, should be an engineer with production ideas.

Those present at the conference were: J. Walter Drake (Hupp), Percy Owen (Liberty), Alfred H. Swayne (G. M. C.), A. T. Waterfall (Dodge), E. A. Williams (Garford), Gaston Plaintiff (Ford), J. E. Kepperley (Overland), H. S. Vance (Studebaker), R. A. Hauer (International), M. L. Hemmingway (M. A. M. A.), Pyke Johnson and John C. Long (N. A. C. C.), T. F. Cullen (Chilton Pub. Co.), Clyde Jennings (Class Journal Co.)

Motor and Accessory Business for Four Months Shows Big Sales Gain and Drop in Past Due Bills

NEW YORK, June 8—Information gathered by the credit department of the Motor & Accessory Manufacturers Association regarding actual sales and credit conditions for the first four months of the year shows an amazing increase in business from January through April and a surprising decline in past due accounts. The figures, compiled from reports made by members of the association, follow:

Month	Total Purchases	Per cent Change	Total Past Due	Per cent Change	Total Notes Outst'g	Per cent Change
January ..	$6,264,587		$8,099,727		$4,359,871	
February .	10,408,962	66.15 Inc.	6,717,165	17.07 Dec.	6,063,118	39.08 Inc.
March	20,120,386	93.30 Inc.	5.603,992	16.57 Dec.	5,069,877	16.38 Dec.
April	26,746,580	32.93 Inc.	5,352,271	4.49 Dec.	5,371,086	5.94 Inc.

Main Will Supervise Purchases in G. M. C.

DETROIT, June 8—J. H. Main, for 10 years purchasing agent for the Cadillac Motor Car Co., has been appointed director of the purchasing section of the Advisory Board of the General Motors Corp., with offices here. He will be succeeded by D. F. Holgrave, who has been an employee of Cadillac for 13 years and for the last three years assistant to Main.

Main is considered one of the best informed men in the purchasing end of the industry and is an authority on iron and steel.

Sloan and Raskob Leave to Study Export Field

NEW YORK, June 9—Alfred P. Sloan, Jr., vice-president of the General Motors Corp., in charge of operations, and John J. Raskob, chairman of the finance committee of the corporation, will sail on the Aquitania, June 14, for a month in England and the Continent.

While their trip is primarily in the nature of a vacation, they will take advantage of the opportunity to determine matters of general policy pertaining to the General Motors Export Co. and study business conditions with special reference to the export situation for American cars.

South Bend Honors Studebaker Leader

Charles M. Schwab Principal Speaker at Testimonial to A. R. Erskine

SOUTH BEND, June 6—Citizens of South Bend gave a testimonial dinner to A. R. Erskine, president of the Studebaker Corp., tonight at which a magnificent silver service was presented to him. Charles M. Schwab, president of the Bethlehem Steel Corp., was principal speaker. He declared the present industrial depression was the best thing that could happen to the country at this time, and that through this depression business would get back to a real basis of economy.

"We have not been economical but we are going to be soon," he said.

Schwab had just returned from a study of conditions in Europe and regarding this said that it was his opinion that Germany would reap the real benefits of the war unless the United States got back to a solid foundation. He said the United States could compete with any nation of the world, but declared capital and labor must work hand in hand to insure a prosperous future.

In speaking of the Studebaker plant after an inspection trip he said he could find no place where he could suggest improvement. He believed this to be the greatest age of all time, that all should be of good cheer and optimistic. Among other speakers were Governor McCray of Indiana, Waddell Catchings, New York banker, and Walter C. Alien, president of the Yale & Towne Lock Co.

International Declares Regular July Dividend

NEW YORK, June 8—Directors of the International Motor Truck Co. at a meeting yesterday declared the regular quarterly dividend of $1.75 a share on the first and second preferred. The dividend is payable July 1 to stockholders of record June 21. International Motors has done a substantial business during the entire period of depression and its cash position is very strong.

Six Moore Officials Convicted of Fraud

Jury Returns Verdict After Four Weeks' Trial—Seek Disposition of Funds

ST. LOUIS, June 6—Five former officers and a former stock salesman of the Moore Motor Vehicle Co., Danville, Ill., have been found guilty of using the mails to defraud by a jury in the East St. Louis Federal Court. The charge resulted from sales of stock in the Moore company. The convicted men are: George L. Moore, Los Angeles; Edward K. Gallagher, Minneapolis; Albert C. Leonard, Denver; John K. Bichl, Chicago; James H. Vickers, Harvard, Ill., and J. W. Patt, Salt Lake City. The latter was the stock salesman. A motion for a new trial was made.

The story of the Moore company, from its inception in a village in Minnesota to a $5,000,000 corporation, was revealed during the progress of the trial. A salesman of the Ford car, his home in the wilds of Minnesota, George W. Moore came into possession of $4,700 worth of used cars taken by a country bank as security for a bad debt. It is asserted by the Federal authorities that Moore gave his unsecured note to the bank for the possession of the cars, and upon this basis organized the corporation of five millions and sold $1,600,000 worth of stock, built many motor cars and went broke, all within four years. The Federal authorities are endeavoring to learn where the money went.

Moore and his associates are charged by the Government with misrepresentation in their efforts to dispose of stock and that the salesmen they employed made impossible allegations. It is further charged that Moore, after he had decided to launch his company, appointed A. C. Leonard, a clerk, and Edward K. Gallagher, a chauffeur, as officers of his company.

From $50,000 to $5,000,000

They first incorporated for $50,000 in Minnesota and later for $5,000,000 in North Dakota, sold the first company to the second company and then launched a campaign of stock selling which assigned 500,000 shares at $10 each in order to capitalize the company to a paid-up basis, and known as "common stock"; $2,000,000 of preferred stock, and $500,000 as "voting" stock, apportioned among the officers and their friends. George Wilson was appointed stock salesman and received 35 per cent of all sold. He died recently. It was alleged at the hearing that Wilson sold the stock at any price he could secure for it, ranging from $3 to $10 per share.

It was asserted that from the time the company was first formed, little effort was made to manufacture cars, the principal business being, apparently, to sell stock. The "voting" stock was restricted to certain persons, as it had ten times the voting power of the common and preferred stock issued to the public in general. The money rolled in so rapidly that Moore became tired of receiving it and delegated this task to a stenographer. He is quoted as saying:

"It was the first time that I knew that a piece of paper could be sold for $10."

Not long after the company began to turn out cars, the operations appeared to show a loss and the stockholders forced a receivership in the hope of recovering their money. Clarence C. Smith, former auditor, testified that the company experienced a loss of $150 upon each car produced. In all 612 cars were marketed.

Employed 30 Stenographers

At one time thirty stenographers were employed whose duties were to send out literature during the stock selling campaign. Louis Platt, former mayor of Danville, testified that the Association of Commerce of that city subscribed to $20,000 worth of stock of the Moore company as an inducement for them to locate. A. Baenger, a consulting engineer of Minneapolis, was sent to Danville to make an appraisal of the Moore plant and fixed the value at $200,000 in 1918. He declined to make any estimate upon the value of the goodwill, due to lack of reliable information.

The plant of the Moore company at Danville is now owned by the American Building Association of Danville, purchase being made for $54,000 when the receiver placed the property upon the market. This money goes to the stockholders after receiver and court costs and various other obligations are satisfied. The indications are that the stockholders will receive but little unless the Federal authorities have better success than the receiver in locating the millions said to have been secured from the sale of stock.

File Petition Against St. Louis Supply Company

ST. LOUIS, June 6—An involuntary petition in bankruptcy has been filed in United States District Court against the American Automobile & Supply Co., this city, by three alleged creditors, whose claims aggregate $1,172.35. It is asserted that during the past three months the defendant has committed acts of bankruptcy by making preferred payments to creditors.

In connection with the action, Luke A. Pryor, now a farmer at West Point, Ark., has been arrested under an indictment charging him with obtaining $55,000 in property and securities under false pretences in selling the automobile company to E. Mason Roberts.

TIRE RECEIVER APPOINTED

NEW HAVEN, CONN., June 6—The City National Bank of Bridgeport has been appointed temporary receiver of the Kelly Tire & Rubber Co. upon application of the Martin Tire & Rubber Co. The receiver is authorized to carry on in such manner as he sees fit and has authority to borrow $10,000.

Goodyear Abolishes Board of Control

Duties of Members Taken Over by New Comptroller—S. A. Falor Resigns

AKRON, June 7—Under the Goodyear Tire & Rubber Co. refinancing and reorganization, the new financial management has abolished the board of control, transferring its duties to the supervision of George E. Einbecker of Milwaukee, who assumes charge of the newly created office of comptroller. This change has resulted in the resignation of Shelby A. Falor, for four years a member of the board of control and formerly in charge of motorcycle and bicycle tire sales. Falor leaves Goodyear to become president of the Universal Drug Co. of Akron, operating a chain of drug stores.

Other members of the board of control who remain with the company but who are assigned other duties are W. D. Shiltz, now assistant secretary of the company, H. B. Hamlen, and W. D. Oburn.

Reports Assets, $198,000,000

AKRON, June 3—"With net tangible assets of $135,000,000, with net quick assets of $63,000,000 and with a total provision of nearly $43,000,000 for adjustment of inventories and for raw materials not yet delivered, the Goodyear Tire & Rubber Co. will be in an exceptionally strong position and looks forward with full confidence to a future of steadily expanding and profitable business, says a statement issued Tuesday by the new management of Goodyear, in connection with the issuance of a new balance sheet as of Feb. 28, 1921.

The company's estimate of net income for interest and taxes for the 12 months to Feb. 28, 1922, is $10,600,000. Net income for the past five fiscal years, after deduction of the inventory adjustment, averaged $12,575,269, the statement reads, or approximately two and three-quarter times the combined annual interest.

The balance sheet shows provision made amounting to $24,000,000 including an additional $8,850,000 for loss on raw materials under contract but not yet received.

Total assets in the new balance sheet are listed at $177,228,515.88. These include property and equipment at Akron of $58,396,088 less depreciation of $11,329,918; the Sumatra rubber plantation at $5,489,828 and branch equipment and automobiles at $1,696,051. In the Oct. 31 balance sheet the Akron plant was listed at $57,913,143, the Sumatra plantation at $5,003,541 and branch equipment and automobiles at $2,393,891. Current assets under the new balance sheet total $42,201,915, including $1,298,838 for work in process and $19,622,250 in finished product. The company has $11,176,095 cash on hand and $19,332,995 in notes and trade acceptance and other assets of $12,500,000.

Colombian Business Due for Quick Boom

Temporary Slump Occasioned by Financial Pinch Passes—Open Up Oil Resources

NEW YORK, June 3—The expectation that business with Colombia will shortly return to normal was expressed in statements just received here from the American Chamber of Commerce of Colombia, Barranquilla, Colombia, the chief port of that rich country. Writing under date of May 18, R. L. Parrish, the acting secretary, declared:

"The business situation in Colombia has at no time been as acute as in other countries. Colombia has no national or municipal debts to speak of. The balance of trade for many years until the last two had been continually in Colombia's favor, which resulted in a substantial accumulation of wealth in individual hands. The sudden slump in prices in 1920 caught a good many importers who had been overbuying and they individually lost some money. The foreign business here was mostly through the American banks. When they shut down suddenly under orders from the United States, the situation was serious and business has not yet recovered its normal tone and volume.

"However, it seems that the situation is growing more tolerable and, in my opinion, Colombia is due for a boom. The foreign trade of Colombia in 1920 approximated $140,000,000, of which considerably more than $100,000,000 was with the United States. The greatest present activity is in the development of the oil resources, mostly by American companies, who are spending large amounts in that line."

Exports of passenger cars to Colombia in 1920 totalled 962, valued at $1,247,976, a striking increase from the 1919 total of 253 with a value of $298,383. Truck exports jumped from 38 in 1919 to 275 last year and parts purchases tripled, the 1920 total being $216,772.

Colombia Starts Roads As Lower Prices Arrive

WASHINGTON, June 3—Road and pavement building has been resumed in Colombia along with a general resumption of construction work on buildings and other public projects. This, according to reports received by the Bureau of Foreign and Domestic Commerce, is due to lowered cost of materials and labor and has resulted in many projects being started which necessarily were halted while prices were high.

Road interest has manifested itself in various parts of the country. In addition to improvements made on roads to outlying towns in the vicinity of Barranquilla, work is continuing on the road being constructed between Barranquilla and Cartagena. This 99 kilometer stretch has been under construction about six years and at present the part from Barranquilla to Sabanalarga and Manati is now in use. The Department of Cauca is also undertaking road construction.

The problem of street paving in Barranquilla is an important one and, according to estimates, will involve an expenditure of about $3,000,000. Plans for the financing of this project were discussed at a municipal meeting attended by the principal merchants.

Americans Monopolize Maltese Car Market

WASHINGTON, June 3—Consul Carl R. Loop, at Valetta, Malta, has reported to the Bureau of Foreign and Domestic Commerce that according to the register of licensed motor vehicles, the most popular makes of foreign automobiles are English and Italian, and of foreign trucks, English. However, the current market is almost entirely monopolized by United States passenger cars, and no new trucks, other than those of United States make, are being offered for sale at the time the report was made.

During the war, the military forces imported lorries and ambulances in considerable numbers and such vehicles are now being sold to private concerns. The list prices at which passenger cars are being sold in Malta vary from £220 to £2600, or, at the then current rate of exchange, $858 to $10,140, the most popular makes selling at £365—$1424—and £410—$1599. The list price of an Italian machine is £450—$1755—and £1080—$4212, respectively. Discounts to distributors are usually 20 and 2½ per cent, but in one case of United States cars and trucks the terms are cash against documents. An Italian company allows its distributors 60 days, and similar terms are the rule with English and French cars.

The four-cylinder car is more popular than the six, for the reason that it is considered to be more economical. The one or two-ton truck is the most popular, as distances are short, the streets and roads narrow, and winding, and business is not sufficiently heavy or congested to require large trucks. According to the official register, 237 passenger cars were licensed in 1920 and 93 trucks.

CRANKCASE DILUTION GAGE

TRENTON, N. J., June 3—E. S. Lea has developed an instrument which when applied to the crankcase of an internal combustion engine indicates to the operator when his crankcase oil has become so much diluted with gasoline or kerosene that it should be replaced. It consists of a float chamber with overflow through which the crankcase oil is circulated by the pump of the lubricating system. When the oil gets too thin a red signal attached to the float shows behind a window. The signal is also out of sight when the oil is not circulating, and the instrument therefore also serves as a circulation indicator. For automobile use the instrument can be applied to the instrument board.

Exports and Imports Fall Off in England

Percentage of Reduction Heaviest on Import Trade—Labor Dispute Harmful

LONDON, May 13 (By Mail)—Official statistics for April's British import and export trade at large reflect very clearly the setback caused by labor disputes culminating in the hold up of manufacturing industries and shipping to an increased extent.

Britain imported in April 399 cars against 1914 in April, 1920, 209 trucks against 1139 in April, 1920, and 274 chassis against 1295 in April, 1920. The value of the chassis parts imported was roughly $1,017,200 against $3,606,700 in April, 1920.

Motorcycles imported were 71 against 475 in April, 1920, but curiously there was a bigger import value of parts, the respective values being for April, 1921, $63,020, and April, 1920, $61,665. The import value of tires fell from $2,506,970 April, 1920, to $817,810 April, 1921, which is a fair criterion of the state of the industry.

The export of British cars was 179 in April, 1921, as against 202 in April, 1920, and their destinations were respectively—British India 28, New Zealand 12, other countries (not specified) 139. The month's export of chassis was 102 against 155 in April, 1920, as follows: South Africa, 5, and other countries (not specified), 97. The month's export of trucks was 88, as against 78 in April, 1920, as follows: British India 33, New Zealand 4, other countries (not specified) 51.

The export value of British tires fell from $1,260,980 April, 1920, to $929,985 April, 1921. These rates are taken at the nominal rate of exchange, viz., $5 to a British £1.

Fiat Polish Factory Starts Work at Warsaw

NEW YORK, June 6—Poland's first motor car factory has been opened at Warsaw, under the title of Spolka Akcyjna Samochodow Polski Fiat, with a capital of five million Polish marks. The new concern, which is most generally described under the abbreviated title of the Polish Fiat, is an offshoot of the big Italian Fiat Co. of Turin, one-half of its capital having been subscribed by Polish financiers, and the rest being of Italian origin.

The Polski Fiat has a modern factory and garages at Warsaw, with a branch at Lodz and representatives at Lublin, Posnan and Leopol. The works are now in full production under the technical direction of the Italian Fiat Co., for the Polski Fiat car is still dependent on the home factory for many of its components. Business conditions are reported to be very promising, the firm having important orders in hand.

Berliet Deficiency 3,000,000 Francs

Stock in Trade Shown as 65,444,021 Francs—To Operate Under Receiver

PARIS, May 28 (By Mail)—The Berliet Automobile Co., having been allowed to take advantage of the French law providing for a transactional arrangement with creditors, under which the payment of debts will be spread over a number of years, a statement has been published covering the financial situation of this concern.

Land, buildings and material are valued at 64,190,117 francs; deposits in the bank are 733,375 francs; government bonds represent 1,039,580 francs; outstanding accounts 17,499,710 francs, and general stock in trade 65,444,021, making a credit total of roughly 149 million francs.

The debit account shows 50 million francs in shares, 25 millions in bonds; 4 millions in various provisions, and 73,368,789 owing to various creditors, making a total of just over 152 million francs. The most important trade creditors are Dinin Storage Battery Co., 407,296 francs; Paul Girod Steel Works, 1,446,050 francs; Michelin Tire Co., 1,310,754 francs; Bergougnan Tire Co., 2,254,812 francs; Nilmelior Magneto Co., 680,075 francs.

The Berliet company is continuing in operation under the control of the government receiver appointed to protect the interests of creditors. A popular 16 hp. automobile on American lines is being produced; trucks are also being manufactured, but the present demand is low.

Poor Crop Prices Hurt Porto Rican Market

SAN JUAN, P. R., May 28 (By Mail)—There are now in Porto Rico over 7000 automobiles. Ford leads with a percentage of 33, Buick second with 17 per cent, and then follow Dodge, Hudson, Chandler, Studebaker, etc.

The roads throughout the Island, owing to the heavy rains, are in very poor shape, this condition being heightened by the operation of truck trains, while the railroad strike is on. For the past week all freight has been carried by truck.

Dealers report business dull, owing to the price of sugar and coffee in the main. Tobacco is hardly worth the marketing, while for a whole year the American Tobacco Co. has had a strike on its hands.

There are at present over 50 passenger buses or as they are known here, "Guaguas," in operation between San Juan and Santurco. A new line of passenger buses called the "Blue Line" has been established between San Juan and Ponco. They are 24 passenger White buses, make the run in about six hours and are meeting with great success.

The firm of Cerecedo & Co. of San Juan has sold its business to F. U. Wells & Co., Inc., including Exide, for which it was distributor. By this purchase and including the large stock of batteries already carried by F. U. Wells & Co., it places them greatly in the forefront in the storage battery field in Porto Rico. They also ship to Santo Domingo, St. Thomas, and other islands.

The P. R. R. R. Co. has adopted wheels for Ford cars, by which they can use the railroad tracks, and are using them as work and inspection cars.

Territories Withdrawn by Ford in Argentina

NEW YORK, June 3—Confirmation that changes are being made in the operation of the foreign business of the Ford Motor Co. has followed the announcement from Buenos Aires of the resignation of E. H. Hampton, manager of the Ford Argentina plant. Advices from Detroit quote W. A. Ryan, the Ford general sales manager, as admitting that the changes are being made in all territories, but he would give no details. Ryan confirmed the resignation of Hampton, whose successor has not been named.

The resignation of Hampton was one of the results, according to reports, of the withdrawal of the exclusive territory to the 325 Ford dealers in Argentina.

R. I. Roberge, manager of Ford foreign sales, has removed his office from New York to Detroit. It is stated that he will handle the major problems of Ford sales from there.

Engine Production Grows Six Times in Five Years

WASHINGTON, June 4—Statistics of engines produced in 1919 as compiled by the Bureau of Census, show that gasoline automobile engines produced in that year were valued at $58,548,000, as compared with $10,122,000 in 1914. Other internal combustion engines, including aviation, were valued at $13,185,000 in 1919; marine, $10,153,000; gasoline stationary, $37,243,000; gas stationary, $10,571,000; portable gasoline engines, $1,127,000, and all other gasoline engines, $1,882,000. Traction engines for farm, military, road and other purposes produced in 1919 were valued at $124,546,000 and in 1914 $4,209,000. Automobile engines listed as steam engines and others were valued at $3,004,000 in 1919. The census reported 199 establishments making internal combustion engines and 85 traction engines.

DAVIS SALES LEAD 1920

RICHMOND, IND., June 3—The George M. Davis Motor Car Co. produced and sold more cars in April, 1921, than in April, 1920, according to Walter C. Davis, secretary and sales manager. Production this year exceeds that for the same month last year by 9 per cent, and the factory is working at its full production schedule. The new cars have met with a gratifying reception.

METAL MARKETS

THERE is no longer any doubt that once the present period of intensive dullness in the steel market shows signs of waning radical reductions in the price schedule of the leading market interest may be looked for. Developments so far have been absolutely in line with those which preceded the previous announcement of cuts in the United States Steel Corp's prices. Then as now it was the American Steel & Wire Co. which led the other subsidiaries of the corporation in the downward revision of prices. That a general reduction in the prices of steel products will be proclaimed by the chief producer at the first sign of a reawakening of representative demand is the belief of conservative market observers. Those who are more radical profess to see in the American Steel & Wire Co.'s announcement indications of a price war or at least of carte blanche given by the corporation to its sundry subsidiaries to meet all price cuts by independent producers. Some characterize the present condition as a "wide-open market." There is, however, very little likelihood of any alteration in the orthodox manner in which steel prices have now been made for many years. Here and there a voice in the "independents'" camp will be heard to the effect that they made a mistake when they raised their prices to bring them up to the levels of the corporation following the latter's last price revision. But in spite of the vicissitudes through which the steel industry is passing sentiment is overwhelmingly in favor of a continuance of the present market generalship. For the present no fault will be found with any producer if he can garner in business that will keep part of his plant running, even though he has to cut way under the corporation's levels. If perchance much business of this character should materialize it will make readjustment or more permanent levels much easier. The automotive industry continues to figure prominently in shipments, but very little in the way of new orders from that source is reported. Reports current in the Youngstown district that the leading maker of low-priced passenger cars contemplated a shutdown of his plants on July 1 were followed on the heel by others that said passenger car builder would enter the market for another tonnage of sheets this week.

Pig Iron.—Manufacturers of automotive engine castings in the Middle West who have been buying on a modest scale during May are curtailing their shipping orders. Although the nominal quotation for No. 2 foundry remains at $23 valley, and for malleable on a like basis, concessions are not difficult to obtain.

Steel.—The sheet tonnage placed by the leading manufacturer of low-priced passenger cars in the last few weeks with mills in Ohio (outside of the valley) and in Pennsylvania, is said to amount to 10,000 tons. A valley producer took 500 tons on a release at 4 cents with extras, the original price having been 8 cents. Canton, Mansfield and Connellsville mills are working on sheets for this consumer. In Youngstown predictions are freely made that sheets will sell on a basis of 3 cents for the black and at proportionate prices for blue annealed and galvanized before the summer is over. Rumors that German sheet bars have been bought at $34 laid down in New York are generally scoffed at in the trade. Laid down at sheet mills the price of these sheet bars would be such that it would be unattractive. Cold-drawn bars are in light demand with a small tonnage on its way to the Cadillac Motor Co. from Pittsburgh district mills.

FINANCIAL NOTES

Maxwell Motor Corp. one, two and three year notes and stock certificates are ready for delivery at the office of the Central Union Trust Co., New York. Holders of certificates of deposit for notes and claims already approved will be entitled to receive cash and notes in the amounts provided in the reorganization plan. Holders of subscription warrants fully paid will be entitled to receive the shares of stock called for by the warrants. Holders of certificates of deposit for stock will get the new stock in accordance with the terms of the plan.

Chandler Motor Car Co. directors have reduced quarterly dividend payments from $2.50 to $1.50 and have declared the usual quarterly payment at the new rate. The $2.50 rate had been paid since October, 1919, when the old stock of $100 par was exchanged for the current shares of no par. This action by Chandler had been expected in the financial community and had been discounted by the recent break of 20 points in the stock.

McCord Mfg. Co. will be back on its feet by August, declares a banker interested in the readjustment of the company. The Detroit plant, which makes radiators, did enough business to offset the slack in other departments without any new money. The company has nearly $500,000 cash on hand, liquidation of inventory is proceeding satisfactorily, payables are being rapidly reduced and quick assets increasing.

United Auto Stores, Inc., directors have authorized a stock increase from $1,000,000 preferred and 40,000 no-par common shares to $5,000,000 8 per cent cumulative preferred (par $100), and 200,000 no-par common shares. Preferred and common stockholders of record June 10 will receive a dividend of 20 per cent in common stock.

International Harvester Co. directors have voted to reduce the dividend rate on the common stock from 7 to 5 per cent and voted a stock dividend of 2 per cent payable July 25. The quarterly cash dividend is payable July 15. Stock outstanding totals $92,000,000. No further reduction in the dividend rate is probable, the directors said.

Burdick Tire & Rubber Co., Noblesville, Ind., has mortgaged its factory for $250,000 to the First Dearborn Savings & Trust Co., Chicago, as trustee, and James S. McClellan, Chicago, as co-trustee. The mortgage runs 10 years and draws 8 per cent interest.

Lee Rubber & Tire Corp. reports sales for the first four months of 1921 exceeded $2,137,000, or 75 per cent of the corresponding period in 1920. April, 1921, sales established a new record at 34,333 casings. Output was reported exceeding 1700 casings daily.

Electric Storage Battery Co. has declared the regular quarterly dividend of $3 on the common stock and the regular quarterly dividend of $3 on the preferred stock, both payable July 1.

Advance Rumely Co. has declared a regular quarterly dividend of 1½ per cent on the preferred stock, payable July 1.

INDUSTRIAL NOTES

Paul Rubber Co., Salisbury, N. C., is erecting a plant for the manufacture of tires. The company expects to be manufacturing tires in 90 days' time. The company is now operating a factory in Chicago, with C. T. Brown as sales manager. When the Salisbury plant is completed it will be made the main factory and the entire organization will move to Salisbury.

Atwater Mfg. Co., Southington, Conn., employing about 250 in the manufacture of drop forgings, has closed down for an indefinite period. It has been operating on a two-shift schedule of eight hours each for the past month. The factory had a large rush order for the Ford Motor Co., which it filled this week.

Altenberg Tire Equipment Co., Davenport, Iowa, has been reorganized with V. D. Sears, president and sales manager, and Ralph T. Hayes, production manager for Moline Plow Co., vice-president and general manager.

Goodyear Tire & Rubber Co. announces that the shutdown of the plant from June 25 to July 5 will not be occasioned by business conditions, but will be solely for the purpose of taking the regular annual inventory.

Rainier Motor Corp. has removed its New York headquarters to 235-7 West Fiftieth Street, where it will have an entire building for sales and services.

Arvac Mfg. Co., manufacturer of accessories at Anderson, Ind., will increase its output May 31 and has notified workers formerly laid off to report.

New Departure Mfg. Co. has removed its Chicago sales and engineering offices to the Peoples Gas Building, 122 South Michigan Avenue.

Gray & Davis, though reducing operations to the plane of current business demands, will continue manufacturing on a substantial scale.

Rome Wire Co. has opened New York sales offices at 50 Church Street under the direction of H. A. Hammond, district manager.

Milburn Capital Stock Increased to Million

TOLEDO, June 6—At a meeting of the officers and directors of the Milburn Wagon Co. it was unanimously decided to increase the common stock of the company from $625,000 to $1,000,000 for the purpose of absorbing the accumulated surplus.

The company will put on about 600 men this month in order to bring its production of bodies for the Olds Motor Co. up to schedule. There are now 220 men employed in the production of Milburn electrics. The schedule calls for about four cars a day.

Officers of the company elected for the year are: Horace Suydam, president; Otto Marx, vice-president; Frank D. Suydam, Jr., secretary, and F. H. Dodge, treasurer.

Maibohm Sues Chamber for Breach of Contract

TOLEDO, June 6—The suit of the Maibohm Motors Co. of Sandusky against the Sandusky Chamber of Commerce for $100,000 for alleged breach of contract will be heard before Judge Harvey Platt, of Tiffin, of the Common Pleas Court.

The motor company brought the suit for damages, charging that the Chamber of Commerce refused to fulfill its part of a contract when the company moved its plant to Sandusky from Racine, Wis., two years ago.

It is expected the trial will begin in the next two weeks.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, June 9—The money market during the past week was characterized by a decided firmness which carried over into the present week. On Thursday call money reached 8 per cent, the highest rate since Feb. 8. The range for the week was 7 per cent to 8 per cent as against 6½ per cent to 7½ per cent in the previous week. Most of the transactions were put through at 7½ per cent. Time money showed tendencies similar to those for call money. Rates for all maturities from 60 days to 6 months were 6¾ per cent to 7 per cent as against 6¾-7 per cent for 60-90 days' and 4 months' paper and 6¼-7 per cent for the longer maturities the week before. Funds were scarce and the supply apparently small, judging by the amount which a 7 per cent bid drew forth. The present firmness is not, it appears, consistent with the usual movement following the meeting of first-of-the-month requirements. There were, however, some Government withdrawals during the week, and a fair amount of new financing.

For the second time in the current year, and for the first time since Feb. 25, 1921, Federal Reserve note circulation of the Reserve System showed an increase. At $2,751,299,000 the Federal Reserve notes in circulation marked an increase for the week of $16,495,000, but are still about $653,632,000 below the peak figures of December 23, 1920. Total gold reserves increased $15,706,000 and total cash reserves $10,598,000.

While the bank statements give evidence of the fundamental improvement which has taken place in the banking situation, there are still signs that the general readjustment has not been completed. Ford has just announced a further cut in the price of his cars, following similar recent announcements by about thirty other automobile manufacturers. Crude oil prices have reached the lowest level in several years, while the steel trade is as yet showing no signs of revival.

It has been estimated that the steel industry is now working at about 25 per cent of capacity as contrasted with about 55 per cent in January and about 80 per cent in the first nine months of 1920. The financial markets have reflected these conditions. In view of further dividend cuts by a number of industrial companies and other unfavorable factors, the stock market declined steadily all week. On Tuesday of the present week many industrial shares reached new levels for the year.

The bond market has been lethargic and gives evidences of needing a respite from the flood of new issues. It was in the foreign exchange market, however, that the most spectacular break came, Sterling declined to $3.76¼ while the French franc broke below 8 cents to 7.88½. Practically all foreign currencies declined on the New York market.

MEN OF THE INDUSTRY

L. D. Maxson has tendered his resignation as purchasing agent of Olds Motor Works at Lansing, Mich., to join Edward Ver Linden, former president of Olds, with the Ver Linden division of the Durant organization. Maxson had been with Olds Motor Works about sixteen years. He will have charge of purchases of all material to be used in the new plant as well as mechanical equipment.

Richard Harfst has been made general manager of the Detroit branch of the Cadillac Motor Car Co., succeeding W. H. Collins, who has joined his father, R. H. Collins, in the latter's new project. For the last year Harfst has been in the office of the president of the General Motors Corp. in New York, from which position he resigned to join Cadillac.

R. E. Wolcott, assistant credit manager, and R. H. Watterman, purchasing agent, of the Miller Rubber Co., have resigned under the company's program of retrenchment of office personnel. The Miller plant is now on a production basis of 3000 tires a day, and expects to continue this program until October.

H. C. Bradfield of Detroit has been appointed director of sales and advertising for the Yellow Cab Mfg. Co., Chicago. Associated with Bradfield as sales manager of the taxicab division is J. B. Dub, who was formerly associated with Bradfield in the former Premier Motor Car Co. of Indianapolis.

A. G. Partridge, who resigned several months ago as vice-president and sales manager of the Firestone Tire & Rubber Co. of Akron, has been appointed sales manager of the Star Rubber Co. He succeeds O. L. Weaver, who it is announced retires on account of ill health.

Sir Henry McGowan, chairman of Nobel's Explosive Co., London, and representative of the British Explosives Trades, Ltd., interests on the General Motors Corp. board, has arrived in New York to attend the stockholders meeting of General Motors the latter part of June.

William C. Williams, production manager of the Chevrolet factory in Fort Worth, has been transferred to the Oakland plant, it was announced here today. Williams came here at the opening of this plant, four years ago. His successor in Fort Worth has not been named.

A. K. McLuney, who left Buick Motor Co. 10 years ago to become Detroit manager of the Studebaker branch and later was a Buick dealer at Utica, N. Y., has returned to Buick, where he is connected with the sales department at the factory.

Hugh W. Stilwell has joined the organization of the Clark-Turner Piston Co., Los Angeles, to take charge of and develop the advertising department. He was formerly connected with the Miner Advertising Agency of Los Angeles.

William J. Wickes, president of the Wickes Boiler Co., Saginaw, Mich., has been made vice-president of the new Ruggles Motor Truck Co., which has taken over the plant of the Saginaw Shipbuilding Co., Saginaw, for its factory.

Fred M. Hoblitt has been appointed general sales manager of the Ajax Rubber Co., to take the place of Fred E. Dayton, who has resigned to become connected with the real estate firm of Cross & Brown in New York.

Paul Andree has been made secretary-treasurer and manager of the Cincinnati office of the R. & V. Engineering Co. He was formerly superintendent in the East Moline factory.

E. P. Mickelberry of Champaign, Ill., has purchased the Bradley Motor Co. business here for $60,000. He will continue the Bradley line agencies with no change in office personnel.

Verne E. Burnett, who has been assistant to Cliff Knoble, advertising manager of the Liberty Motor Car Co., has resigned to join the advertising staff of the Cadillac.

Hays McFarland has been appointed sales manager of the Bassett Mfg. Co., Chicago, manufacturers of lubricating systems.

D. E. Kirk has resigned from the Green, Fulton. Cunningham Advertising Co. to join the Evans-Ayres company.

J. Henry Smith has been appointed vice-president of the Sheet Steel Products Co., Michigan City, Ind.

Goodrich Retrenchment Makes Changes in Staff

AKRON, June 7—Changes in personnel incident to office force readjustments under the B. F. Goodrich Co.'s policy of retrenchment have resulted in the resignations of E. C. Tibbetts as Goodrich advertising manager, James O'Mara, director of publicity; E. P. Rowen, in charge of Diamond tire sales; R. E. Hackenger, assistant advertising manager, and Milton Fassnacht, in charge of tire adjustments.

Tibbetts and Rowen were two of the oldest Goodrich officials, each having been with the company over 15 years. Rowen was formerly with the Diamond Tire Co., joining Goodrich with consolidation of the two companies in 1904. Tibbetts has been with Goodrich for over 25 years.

In addition to office personnel cuts, the Goodrich company has enforced a program of salary readjustments and has limited all vacations this year to one week.

Preston Motors Assigns Cuban Distributorship

BIRMINGHAM, ALA., June 3—J. T. Driver, vice-president and general sales manager of the Preston Motors Corp., announces the initial steps of his concern to go after export business. E. I. Matthews, formerly with the State auditing department of Florida, has been assigned as distributer for that State and Cuba. Matthews expects to leave for Cuba in the near future to perfect his sales and distribution organization for that territory and to launch an extensive advertising campaign.

"Mr. Matthews, being located in Florida, which is just a stone's throw from Cuba, knows Cuba and its marketing conditions, and is going to make us an excellent representative," Driver said. "It is the first step we have taken toward going after foreign business by establishing a direct distributer. However, we are planning an export advertising campaign at the present time and expect to be doing a good export business by next winter. We are going to impress upon the foreign buyer the wonderful location of Birmingham, our direct water route with gulf ports and our excellent shipping facilities."

Court Gives Verdict for Engineering Error

PARIS, May 28 (By Mail—French civil courts have condemned the Automobile Club of France to pay Alexandre Anzani, aviation engine manufacturer, a sum of $2,000 as damages for wrong awards in an aviation engine competition held in 1913. In this competition, which included all the leading French manufacturers of aviation engines for the period, the first prize was given to the Gnome company for its rotary type engine. Considering that there had been a mistake, Anzani had all the figures verified and brought forth definite proof that the engineers of the Automobile Club of France had made errors in their calculations As the club refused to recognize its mistake or to publish any correction in its official bulletin, Anzani brought the matter before the civil courts, with the result stated above.

Leach Biltwell Buys Miller Engine Works

LOS ANGELES, June 3—The Leach Biltwell Motor Co., which has been incorporated with a capital of $5,000,000, has acquired the Miller Engine & Foundry Works of this city. M. A. Leach, president and founder of the motor company, becomes president of the new corporation.

The Miller works were owned by Harry A. Miller, builder of motors for automobile racers, who controlled patents for a new motor which will be constructed especially for the Leach cars. Miller becomes a director and second vice-president of the new company and will superintend the building of the motor. Other officers of the new corporation are John T. Dye, first vice-president; Grey M. Skidmore, treasurer, and James H. Faircloth, secretary.

ALLEGE FALSE STOCK SALES

ROCKFORD, ILL., June 6—Jack Felch of this city has filed information in Belvidere, Wis., against five officers and a salesman of the Prudential Tire & Rubber Co., alleging sales of stock under false pretenses. He claimed that representation was made that the Prudential company, which had leased the Boone Tire & Rubber Co. plant, had taken over its business and on this basis was exchanging $300 stock in the Boone company for $200 stock in the Prudential company and $100 cash. The Boone company still maintains its properties

Calendar

SHOWS

Sept. 5-10—Indianapolis, Automobile and Accessory Show in conjunction with Indiana State Fair, conducted by Indianapolis Automobile Trade Association, John B. Orman, Mgr.

Sept. 28 - Oct. 8 — New York, Electrical Exposition, 71st Regt. Armory, Electric Equipment, Machinery and Vehicles.

Nov. 27-Dec. 3—New York, Automobile Salon, Hotel Commodore.

January — Chicago, Automobile Salon, Hotel Drake.

FOREIGN SHOWS

June, 1921—Reykjavik, Iceland, Agricultural Exhibition—Agricultural Machinery—Icelander Agricultural Society, Reykjavik, Iceland.

September—Buenos Aires, Argentina, Passenger Cars and Equipment. La Pabellon de las Rosas. Automovil Club Argentino.

September—Buenos Aires, Argentina, Cars, Trucks, Tractors, Farm Lighting Plants and Power Farming Machinery. Palermo Park; Sociedad Rural Argentina.

September—Luxemburg, Luxemburg, Agricultural Sample Exhibition.

Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

Nov. 4-12 — London, British Motor Show, Society Motor Mfrs. and Traders.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

CONVENTIONS

July 4-9 — Mackinac Island, Mich., Summer Meeting Automotive Equipment Association.

Oct. 12-14, 1921 — Chicago, Twenty-eighth Annual Convention National Implement & Vehicle A'ssn.

Nov. 22—New York, Convention of Factory Service Managers, National Automobile Chamber of Commerce.

RACES

June 18—Uniontown, Pa., Speedway Events.

July 25—Grand Prix, Le Mans.

Labor Day—Uniontown, Pa., Autumn Classic.

Pintle Hook Mounting Standardized by N.A.C.C.

NEW YORK, June 6—The Truck Standards Committee of the National Automobile Chamber of Commerce has adopted the following recommendation: Where a pintle hook is attached to a motor truck or tractor frame, the hook itself shall be of the U. S. Government type. This hook shall be so mounted that the axis of the drawbar head shall be located both vertically and horizontally approximately in the center of the frame of the chassis. A means shall be provided for fastening one end of the safety chain to the rear end of the motor truck chassis frame. The clevis is to be located directly under the axis of the drawbar head or as near to this position as possible.

The Trailer Manufacturers' Association of America has suggested that it is not necessary for the truck manufacturer to place a spring behind the drawbar head or pintle hook on motor trucks. They state that trailers made by reputable trailer manufacturers have a starting and stopping spring in the drawbar or trailer head, which is or should be of proper length and strength so that any additional spring furnished by the truck manufacturer would give too much spring action, causing the trailers to jerk and bump the truck. Nevertheless the N. A. C. C. Truck Standards Committee recommends that wherever possible truck manufacturers equip their drawbar heads with springs for the better protection of the truck frame and driving mechanism.

Dort First and Third in Argentine Road Race

FLINT, MICH., June 6—Establishing a new South American long-distance record for reliable performance as well as fast time, a Dort car won the annual Argentine classic, held this year at Rafaela, northern Argentina. In a field of 16 entries, among which were one Vauxhall, two Fiats and three Dodge cars, the Dort came home the winner.

This annual cross country run covered a distance of 392 kilometers, or 244 miles, over all sorts of roads, which taxed the entries to the utmost. Of the 16 models lined up for the start, only four finished, among which were two Dorts, taking first and third places. The time was 4 hours and 41 minutes, an average of 84 kilometers per hour. This establishes a new South American long-distance speed record and also wins the special prize offered by the Automobile Club of Argentina for regularity in performance.

Progress of Industry to Be Shown in Chicago

CHICAGO, June 3—C. R. Richards, dean and director of the engineering experiment station at the University of Illinois, is making plans for a comprehensive exhibit of the automotive industries during the Pageant of Progress Exposition on the Municipal Pier here, July 30 to August 14. There will be displayed everything that goes to make up an automobile, a motorcycle or an airship with exhibits in this division of the oldest styles of cars and airplanes to the most modern. There will be model factories and actual working exhibits.

Development of the mechanism of automobiles and trucks will be shown inclusive of types of engines, exhibits of early engines, the trend of design in the development of the engine with its cooling and lubricating system, the carbureter, gasoline tank and methods of starting; the transmission system, electric system and the development of tires. This latter exhibit will include a comprehensive display of various types of wheel construction, demountable rims, and strides made in the manufacture of pneumatic and solid tires. An electric dynamometer with some form of modern automobile engine mounted on it and operated will be one of the interesting features of the exhibit.

SUE ON INTERLOCKING STOCK

AKRON, June 7—Seventy-two individual actions have been initiated in the Common Pleas Courts of Summit County at Akron by Elihu Harpham, receiver of the defunct Interlocking Cord Tire Co., against as many stockholders of the company demanding payment of unpaid amounts due on stock subscriptions. The amount involved aggregates $15,432. Recently Harpham filed 36 similar suits.

Speed Limits Lifted on French Highways

PARIS, May 20 (By Mail)—No official speed limit now exists in France, but motorists will be held responsible for the accidents they cause by reason of negligence or incompetence. The wiping out of the speed limit is in accordance with public sentiment, which has long recognized that an arbitrary limit was no protection to users of the road, while often being an arm for the persecution of motorists.

This change has been made in an entirely new set of national laws covering all phases of road travel and abolishing the local and often arbitrary and antiquated regulations in force in various parts of the country. The right hand rule of the road is maintained, despite an agitation in favor of the English or left hand rule. Traffic on national highways has the right of way, and when two roads of equal importance cross drivers must give way to vehicles approaching on their right.

The speed limit is maintained for trucks and passenger carrying vehicles weighing 3 tons. The Government driving license, granted after a practical examination, also has been maintained. Under the new laws all vehicles must carry lights, but dazzling headlights cannot be employed in towns or cities. Animals allowed to wander on the road will do so at their owners' risk.

Quality Tire Creditors File Bankruptcy Appeal

INDIANAPOLIS, June 4—A creditors' petition in bankruptcy has been filed against the Quality Tire & Rubber Co. of Anderson, Ind., in Federal Court yesterday by the Great Falls Mfg. Co., the Marlboro Cotton Mills and the Katzenbach & Bullock Co. In their petition they allege that the tire company is insolvent and sought recently to transfer a portion of its property to certain of its creditors. They also sought to obtain back salary of $215.93 for its president, H. C. Yauky. The Great Falls Mfg. Co. places its account against the tire company at $70,000, the Marlboro Cotton Mills at $112,000 and the Katzenbach & Bullock Co. at $92.